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Atlantic Oceanographic and Meteorological Laboratory
Miami, Florida

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The findings and conclusions in this report are those of the authors and do not necessarily represent the views of the funding agency.

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List of Acronyms

ADCP	Acoustic Doppler current profiler
AOML	Atlantic Oceanographic and Meteorological Laboratory
BDL	Below detection limit
DIN	Dissolved inorganic nitrogen
DIP	Dissolved inorganic phosphorus
DOP	Dissolved organic phosphorus
FACE	Florida Area Coastal Environment
FAU	Florida Atlantic University
FIB	Fecal indicator bacteria
MGD	Million gallons per day
NOAA	National Oceanic and Atmospheric Administration
POM	Particulate organic matter
qPCR	Quantitative polymerase chain reaction
TDP	Total dissolved phosphorus
TN	Total nitrogen
TOC	Total organic carbon
TON	Total organic nitrogen
TSS	Total suspended solids
RSMAS	Rosenstiel School of Marine and Atmospheric Science

THE BOYNTON-DELRAY COASTAL WATER QUALITY MONITORING PROGRAM

Abstract

This report discusses a sequence of six cruises in the vicinity of the Boynton-Delray (South Central) treated-wastewater plant outfall plume (26°27'43"N, 80°2'32"W), the Boynton Inlet (26°32'43"N, 80°2'30"W), and the Lake Worth Lagoon, Palm Beach County, Florida. The sampling cruises took place on June 5-6, 2007, August 28-29 2007, October 18-19 2007, February 14 and 18 2008, May 19-20 2008, and July 11-13 2008. Water was sampled at eighteen locations at the surface, middle, and near the sea floor (where there was sufficient depth), for a total of 45 samples; these were analyzed for a variety of nutrients and related parameters. The water sampling unit contained a conductivity / temperature / depth instrument (CTD) from which data were obtained at each sampling site. Synchronal ocean current data was measured by nearby acoustic Doppler current profiler (ADCP) instrument.

The inlet measurements were consistently lower in salinity and more acidic (lower in pH) than the coastal ocean, and were warmer during the May and especially during the February cruise. For most analytes, viz., nitrite+nitrate (N+N), total suspended solids (TSS), chlorophyll-a, silica (Si), and total dissolved nitrogen (TDN), the lagoon concentrations were significantly higher than the coastal ocean; the inlet concentrations appeared to be consistent with lagoon water with partial mixing with the coastal ocean, as expected. Estimates of the nutrient flux to the coastal ocean were computed: about 1,500 kg of dissolved N, 2,350 kg of silicate, 33 kg of orthophosphate (P), and 59 kg of ammonium (NH_4) per day were delivered to the coastal ocean through the inlet.

South Central Outfall

The outfall boil at South Central (the smallest in volume of the six outfalls in the SE Florida) is only visible under ideal conditions. In the six cruises described in this document, the outfall boil could be found only in one (August 2007). Elevated concentrations of nutrients (N+N, P, Si, P) at the outfall vicinity were measured and these concentrations decreased rapidly away from the outfall for most analytes, to become undistinguished from the background within 3 km or less. Not finding the boil, however, in five of six cruises meant that the waters with the highest concentrations were probably missed. In August 2007, when the boil was sampled, N+N, P, and TDP concentrations at the boil were roughly the same as from the inlet. For other analytes (chlorophyll-a, TSS, Si, dissolved organic carbon [DOC]) the concentrations at or near the outfall were significantly less than those from the lagoon and inlet on most of the cruises.

Coastal Ocean

The coastal ocean appeared significantly impacted by the Boynton Inlet, and, less so, from the inlet. A suggestion of a source to the south was seen in some analytes. Measurements from the Gulf Stream Reef area were the lowest in the study, and may provide 'background' concentrations for this region. As expected, the coastal ocean was

warmer and more stratified in the summer compared to the winter; e.g., whereas no thermocline was noted in CTD data from February 2007, a strong thermocline was observed in most casts during July 2008. In certain cases (e.g.., N+N in June 2007, pH in July 2008), an increase in the concentration (decrease for pH) from north to south implied a source from the south, e.g., the Boca Raton Inlet or Boca Raton outfall. .

1.0 INTRODUCTION

The present document provides a data summary for six water quality monitoring cruises conducted between June 2007 and July 2008. The area monitored extended from approximately 5 km south of the South Central ocean outfall to just north of the Boynton Inlet.

2.0 BACKGROUND

The coastal ocean area for which this water quality monitoring has been designed is subject to the multiple coastal ocean processes and is subject to the presence of multiple water mass types. Multiple sources of nutrients to the coastal ocean area are likely to be present including upwelled deep ocean water, inlet outflow, groundwater discharge, ocean wastewater effluent discharge, atmospheric deposition and, possibly, septic discharge. Only a limited database of nutrient and water mass type parameters exists for the coastal ocean area of Boynton-Delray. A local environmental group (Reef Rescue, Tichenor 2005) most recently carried out an approximately 5 month long water quality measurement program extending from August 2005 to December 2005. The monitoring program described herein measured many of the same parameters at or near the same locations as those used in the Reef Rescue effort. Other parameters were measured as well, which may be useful in examining water mass types and other regulatory concerns, e.g. ammonia.

3.0 MONITORING GOALS AND OBJECTIVES

The objectives of the water quality monitoring are provided below.

1. To obtain a database for water quality parameters including the following: (i) the dissolved nutrients NH_4-N, Nitrite-N, Nitrate+Nitrite-N, Orthophosphate-P, Silicate-Si, Total Dissolved Phosphorus and Total Dissolved Nitrogen (ii) Chlorophyll a, (iii) Total Suspended Solids, (iv) pH, (v) Dissolved Organic Carbon

2. To obtain vertical profiles of temperature and salinity essentially concomitantly with water quality samples

4.0 WATER QUALITY MONITORING

4.1 Site Location and Description

The coral reef system (Gulfstream Reef, Delray Ledge and Seagate Reef) is located approximately one mile offshore of Palm Beach County (Figure 1). This area forms the northern section of reef tract, which runs from the Dry Tortugas, through the Florida Keys and north to Palm Beach County. The reef ranges in depth from 10 to 30 meters and is in close proximity to the Gulf Stream. The Boynton Beach Inlet is located and discharges to the north and west of the reef system, while the South Central Ocean

Outfall is located and discharges to the south and on the edge of the reef system with the exception of Seagate Reef which is located to the south of the outfall.

Sampling events occurred at 18 pre-established monitoring stations. Each station was sampled at three different depths: surface, mid-depth and near bottom (except for Station BD-13 and BD-16 thru BD-18 surface only, and station BD-14 surface and near bottom). Station locations are identified in Table 1 and shown in Figure 1. Sampling events were conducted from south to north in an effort to increase the likelihood of obtaining samples from within the same water mass since the predominant current is north. All efforts were made to sample on an outgoing tidal cycle in order to get the maximum impact of the Lake Worth Lagoon on the sampling area. This was dependent upon timing and weather conditions.

Table 1: Water Quality Sampling Sites

Station #	Latitude	Longitude	Station #	Latitude	Longitude
BD-1A	26.42565	-80.04542	BD-9A	26.50833	-80.04167
BD-1B	26.42565	-80.04542	BD-9B	26.50833	-80.04167
BD-1C	26.42565	-80.04542	BD-9C	26.50833	-80.04167
BD-2A	26.44212	-80.04725	BD-10A	26.52273	-80.03228
BD-2B	26.44212	-80.04725	BD-10B	26.52273	-80.03228
BD-2C	26.44212	-80.04725	BD-10C	26.52273	-80.03228
BD-3A	26.45803	-80.04252	BD-11A	26.53333	-80.03583
BD-3B	26.45803	-80.04252	BD-11B	26.53333	-80.03583
BD-3C	26.45803	-80.04252	BD-11C	26.53333	-80.03583
BD-4A	26.46192	-80.04208	BD-12A	26.53874	-80.03980
BD-4B	26.46192	-80.04208	BD-12B	26.53874	-80.03980
BD-4C	26.46192	-80.04208	BD-12C	26.53874	-80.03980
BD-5A	26.46628	-80.04182	BD-13A	26.54542	-80.04300
BD-5B	26.46628	-80.04182	BD-14A	26.54747	-80.04003
BD-5C	26.46628	-80.04182	BD-14C	26.54747	-80.04003
BD-6A	26.47558	-80.03995	BD-15A	26.55907	-80.03327
BD-6B	26.47558	-80.03995	BD-15B	26.55907	-80.03327
BD-6C	26.47558	-80.03995	BD-15C	26.55907	-80.03327
BD-7A	26.48773	-80.03933	BD-16A	26.54626	-80.04818
BD-7B	26.48773	-80.03933	BD-17A	26.54266	-80.04793
BD-7C	26.48773	-80.03933	BD-18A	26.53944	-80.04954
BD-8A	26.51073	-80.03543			
BD-8B	26.51073	-80.03543			
BD-8C	26.51073	-80.03543			

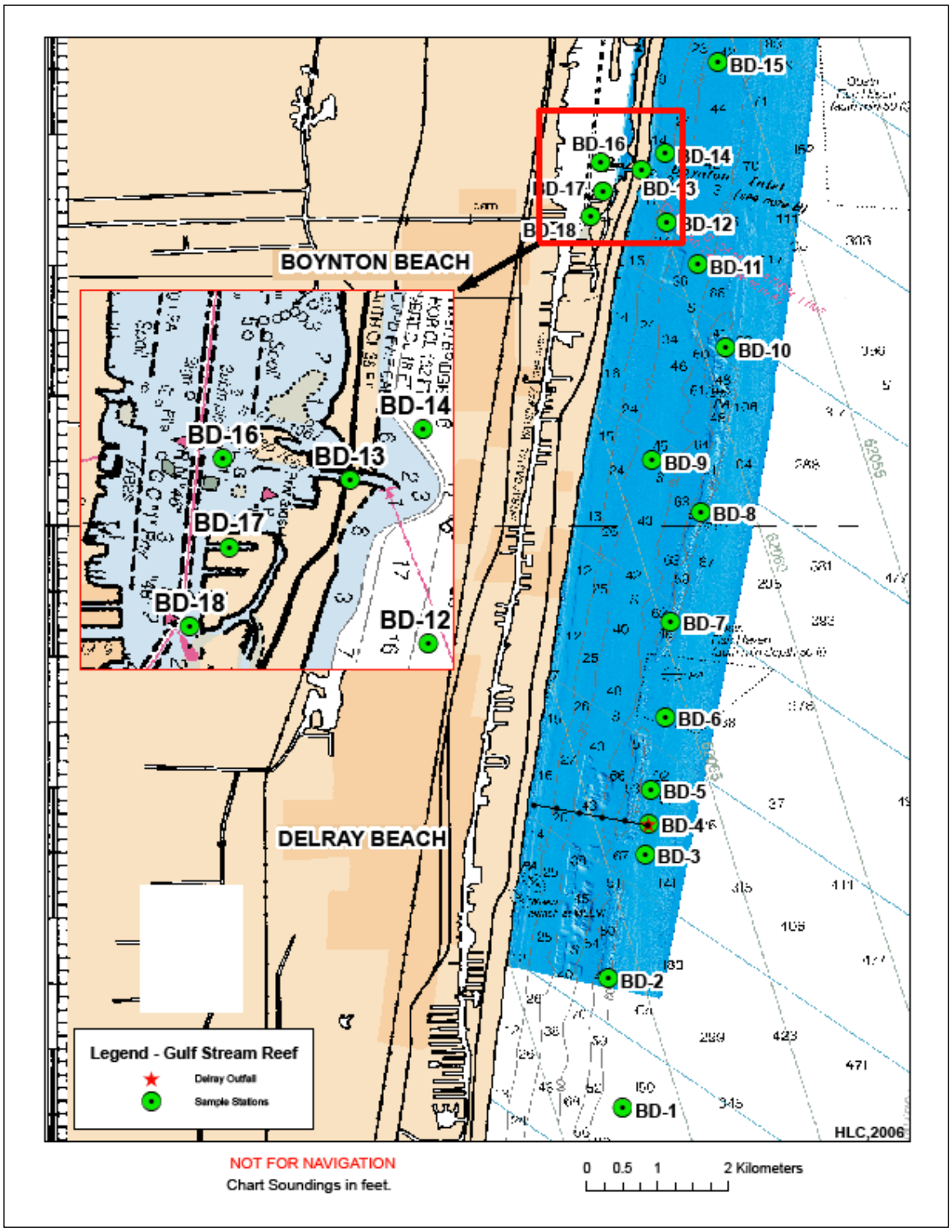

Figure 1: Map of station locations. Red star indicates location of the South Central Ocean Outfall. Numbers indicate sample station.

4.2 Sampling Overview

Details of the six water quality monitoring cruises are given in Table 2.

Table 2: Sampling Cruises

Cruise	Calendar Days	DecDay	Current	Inlet flow	Boil	Ship
1	June 5 and 6, 2007	155, 156	N	Ebb	not vis.	RV Cable
2	August 28 and 29, 2007	240, 241	N	Ebb	visible	RV Cable
3	October18 and 19, 2007	291, 292	N	Ebb	not vis.	RV Cable
4	February 14 and18, 2008	45, 49	N	Ebb	not vis.	RV Nancy Foster
5	May 19 and 20, 2008	140, 141	N	Ebb	not vis.	RV Cable
6	July 11 and 12, 2008	193, 194	N,S	Ebb	not vis.	RV Walton Smith

4.3 Field Parameters

Field parameters collected for the six water quality monitoring cruises are listed in Table 3.

Table 3: Measurements obtained from the water quality monitoring program

Water Column Profile Measurements	Discrete water sample measurements
Conductivity (mS/cm)	Nutrients (µM)[1]
Temperature (^{0}C)	Chlorophyll a (µg/L)
Depth (m)	pH (units)
Dissolved Oxygen (mg/L)	Total Suspended Solids (mg/L)
pH (units)	Dissolved Organic Carbon (µg/L)
Salinity (units)	
Turbidity (NTU)	
Chlorophyll a (µg/L)	

[1]Nutrients include Ammonia, Nitrate+Nitrite, Orthophosphate, Silicate, Total Dissolved Nitrogen and Total Dissolved Phosphorus.

5.0 FIELD SAMPLE COLLECTION METHODS

5.1 Water Column Data Collection

A YSI 6600 Sonde or Seabird 911 CTD cast was conducted at each monitoring station at the same time the Niskin bottles were lowered. Each time the YSI/CTD was turned on, data was recorded internally every second. For each cast, the station number, cast number and time were recorded.

The sensors on the YSI/CTD unit were equilibrated with sample water. The YSI/CTD unit was turned on, lowered into the water until the entire unit was submerged, and held stationary for one minute. The YSI/CTD unit was then slowly lowered to the bottom and retrieved. Data was processed, analyzed and archived back at AOML.

5.2 Water Sample Collection

At each station discrete water samples were collected for nutrients, dissolved organic carbon (DOC), pH, total suspended solids and chlorophyll a. Once on site the depth was determined from the RV Cable or RV Nancy Foster using it's depth sounder. Once the depth was determined three 5-L Niskin bottles were attached to the line to sample the surface, mid depth and near bottom of that particular station (R/V Nancy Foster used a CTD rosette with 12 2-L Niskin bottles). The Niskin bottles along with the YSI/CTD unit were lowered by winch and water samples collected by the Niskin bottles at the appropriate depths. Niskin bottles were retrieved and sample water withdrawn and placed in pre-labeled sample containers. Sample containers were placed on ice (4^0C) in storage coolers aboard the RV Cable or RV Nancy Foster and transported back to AOML for processing and analysis.

6.0 ANALYTICAL METHODS

6.1 Chlorophyll-a and Phaeopigment Analysis

Chlorophyll-a concentrations were determined via a standardized filtration-extraction method using a 60:40 mixture of acetone and dimethyl sulfoxide (Shoaf and Lium, 1976; Kelble et al., 2005). The fluorescence of each sample is measured before and after acidification in order to correct for phaeophytin on a Turner Designs model TD-700 fluorometer. The fluorescence values are calibrated using known concentrations of chlorophyll a to yield chlorophyll a concentrations in mg/m^{-3}.

6.2 Total Suspended Solids Analysis

Total suspended solids (TSS) were determined gravimetrically for each station following Young et al., (1981) and Kelble et al., (2005). As a large a volume of the sample as possible, with a minimum of 200 ml, is filtered onto preweighed filters that are dried and reweighed to calculate TSS via the following equation:

$$\mathbf{TSS = (W_{post} - W_{pre})/V_{filtered}}$$

where W_{pre} is the prefiltration weight, W_{post} is the post filtration weight, and $V_{filtered}$ is the volume filtered.

6.3 Nutrient Analysis

Nutrient analyses were conducted using the following EPA methods.

Method 349.0 was used to determine the concentration of ammonia ("NH_4") for each station (Zhang et al., 1997). This method uses automated gas segmented continuous flow colorimetry for the analysis of ammonia. Ammonia in solution reacts with alkaline phenol and NADTT at 60 ^{0}C to form indophenol blue in the presence of sodium nitroferricyanide as a catalyst. The absorbance of indophenol blue at 640 nm is linearly proportional to the concentration of ammonia in the sample. Results are given µM (10^{-6} moles of N per liter) units.

Method 353.4 was used to determine the concentration of nitrate and nitrite ("N+N") for each station (Zhang et al., 1997). This method uses automated gas segmented continuous flow colorimetry for the analysis of nitrate ("NO_2") and nitrate ("NO_3"). In the method, samples are passed through a copper-coated cadmium reduction column. Nitrate is reduced to nitrite in a buffer solution. The nitrite is then determined by diazotizing with sulfanilamide and coupling with N-1-naphthylethylenediamine dihydrochloride to form a color azo dye. The absorbance measured at 450 nm is linearly proportional to the concentration of nitrite + nitrate in the sample. Nitrate concentrations are obtained by subtracting nitrite values, which have been separately determined without the cadmium reduction procedure, from the nitrite + nitrate values. Results are given µM (10^{-6} moles of N per liter) units.

Method 365.5 was used to determine the concentration of orthophosphate ("P") for each station (Zimmermann and Keefe, 1997; Zhang et al., 2001). This method uses automated calorimetric and continuous flow analysis for the determination of low-level orthophosphate concentrations. Ammonium molybdate and antimony potassium tartrate react in an acidic medium with dilute solutions of phosphate to form an antimony-phospho-molybdate complex. This complex is reduced to an intensely blue-colored complex by ascorbic acid. The absorbance measured at 800 nm is proportional to the phosphate concentration in the sample. Results are given µM (10^{-6} moles of P per liter) units.

Method 366.0 was used to determine the concentration of silica ("Si") for each station (Zhang and Berberian, 1997). This method uses automated gas segmented continuous flow colorimetry for the analysis of dissolved silicate concentration. In the method, β-molybdosilicic acid is formed by reaction of the silicate contained in the sample with molybdate in acidic solution. The β-molybdosilicic acid id then reduced by ascorbic acid to form molybdenum blue. The absorbance of the molybdenum blue, measured at 66 nm, is linearly proportional to the concentration of silicate in the sample. Results are given µM (10^{-6} moles of Si per liter) units.

Method 367.0 was used to determine the total phosphorus ("P") concentration for each station (Zhang et al, 1998). This method determines total dissolved phosphorus (TDP) concentration by autoclave promoted persulfate oxidation of organically bound phosphorus followed by a gas segmented continuous flow colorimetric analysis of digested samples. In this method, dissolved organic phosphorus (DOP) in the water reacts with persulfate in acidic media at elevated temperature and pressure. An autoclave is used to achieve a temperature of 120 ^{0}C and pressure of 2 atmospheres, which

promotes oxidation. After samples are cooled to room temperature, aliquot of ascorbic acid is added to remove the free chlorine formed in seawater during the digestion. Those autoclaved samples are then analyzed for phosphate concentrations by the molybdenum blue calorimetric method using a gas segmented continuous flow analysis by a Flow Solution Analyzer. In this method phosphate reacts with molybdenum (VI) and antimony (III) in an acidic medium to form an antimonyphosphomolybdate complex. This complex is subsequently reduced by ascorbic acid to form a blue complex and the absorbance measured at 710 nm. Undigested samples are analyzed separately to obtain the concentration of dissolved inorganic phosphate (DIP). Dissolved organic phosphorus is calculated as the difference between total dissolved phosphorus and dissolved inorganic phosphorus (DOP = TDP – DIP). Results are given µM (10^{-6} moles of P per liter) units.

Total dissolved nitrogen ("TDN") was measured using the thermal decomposition/NO detection chemiluminescence method in a Shimadzu total organic carbon analyzer (Schimadzu, 2004). When a sample is introduced into the combustion tube (furnace temperature 720^0C), the TN in the sample decomposes to nitrogen monoxide. Nitrogen gas does not become nitrogen monoxide under these circumstances. The carrier gas, which contains the nitrogen monoxide, is cooled and dehumidified by the electronic dehumidifier. The gas then enters a chemiluminescence gas analyzer, where nitrogen monoxide is detected. The detection signal from the chemiluminescence gas analyzer generates a peak and the TN concentration in the sample can then be measured. Results are given µM (10^{-6} moles of N per liter) units.

6.4 Dissolved Organic Carbon

Dissolved organic carbon ("DOC") was measured by Shimadzu total carbon analyzer (Schimadzu, 2004). This method determines the organic content after the removal of inorganic carbon. The sample is acidified to a pH of 2 to 3 and subsequently degassed. Carbonates are not stable anymore with this pH value and therefore, form carbon dioxide. The inorganic carbon is removed by degassing. The organic carbon contents of the sample are introduced into the combustion tube, which is filled with an oxidation catalyst and heated to 680^0C. The sample is burned in the combustion tube and the contents are converted to carbon dioxide. Carrier gas, which flows at a rate of 150 mL/min to the combustion tube, carries the sample combustion products from the combustion tube to an electronic dehumidifier, where the gas is cooled and dehydrated. The gas then carries the sample combustion products through a halogen scrubber to remove chlorine and other halogens. Finally, the carrier gas delivers the sample combustion products to the cell of a non-dispersive infrared (NDIR) gas analyzer, where the carbon dioxide is detected. The NDIR outputs an analog detection signal that forms a peak. From this the concentration of DOC can be determined. Results are given µM (10^{-6} moles of C per liter) units.

7.0 PROCEDURES FOR WATER SAMPLE ANALYSIS

7.1 Chlorophyll Analysis

Water samples were filtered through 25 cm 0.45-µm glass fiber filters using a filter apparatus either attached to a hand pump or a vacuum pump. Approximately 200 ml of sample water was filtered. Before filtering the next sample station, the filtering apparatus was cleaned by rinsing with de-ionized water. The filter was folded in half by forceps, making sure not to touch with hands and placed in a 2 ml polypropylene vial. A duplicate from the same sample was also filtered and placed in the same vial. Sample vials were placed in a 20 L Dewar of liquid nitrogen until analyzed.

7.2 Total Suspended Solids Analysis

Water samples were filtered through pre-weighed 47 mm 0.4-µm polycarbonate filters. Each filter was placed in a pre-labeled 47-mm petri dish with lid and placed in a drying oven for 24 hrs. at 60 ^{0}C. Petri dishes with filters were taken from the oven and allowed to cool in a dessicator. After cooling, filters were removed from the petri dishes with forceps and weighed on an AD-6 autobalance. Filters were not touched or left out in open air for any period of extended time to avoid collection of moisture which would lead to erroneous results. Filters were dried and pre-weighed before each water quality monitoring cruise.

7.3 Nutrient Analysis

Water samples were filtered through 0.45-µm membrane filters using a 50 ml syringe and collected in two 8ml polystyrene test tubes, one for NH_4 analysis and the other for N+N, NO_2, P, and Si analysis. The filter were washed before use by passing 25 ml of sample water through the filter. The sample tubes were rinsed three times with sample water, shaking with the cap in place after each rinse, then filled with sample water and preserved. Ammonia samples were preserved by addition of 0.2% (V/V) of chloroform. All sample tubes were placed upright in a test tube rack and refrigerated in the dark on ice (4^{0}C) and transported back to AOML for analysis.

7.4 Dissolved Organic Carbon Analysis

Water samples were filtered through GF/F filters to remove any particulate materials from the sample. Before filtering, the filters were baked at 450 ^{0}C for 4 hours to remove any organic carbon from the filters. After filtration a subsample was placed in a pre-cleaned 10 ml glass vial and placed in the auto-sampler of the Schimadzu Total Organic Carbon Analyzer V-CPH/CPN and the amount of dissolved organic carbon measured.

8.0 QUALITY ASSURANCE AND QUALITY CONTROL

Quality assurance provides a process for ensuring the reliability and value of measured data. Sound QA practices are essential to acquire data of the necessary type and quality for their intended use.

8.1 MEASUREMENT QUALITY OBJECTIVES

Measurement quality objectives (MQO's) are defined as acceptance criteria for the quality attributes measured by project quality indicators (EPA, 2002). They are quantitative measures of performance. These are often the accuracy, precision, completeness, and bias guidelines against which laboratory and some field QC results are compared. The acceptable levels listed in Table 4 are to be applied to batch-level data and may be assessed by only a few QC samples.

Table 4: Measurement Quality Objectives

ANALYTE	ACCURACY	PRECISION	COMPLETENESS
FIELD CONSTITUENTS			
Conductivity	± 0.5%	NA	90%
Salinity	± 1%	NA	90%
Temperature	± 0.15 ^{0}C	NA	90%
pH	± 0.2 units	NA	90%
Dissolved Oxygen	± 2%	NA	90%
Turbidity	± 5%	NA	90%
Chlorophyll	N/A	NA	90%
LAB CONSTITUENTS			
Ammonia (NH_4)	10%	10%	95%
Nitrate + Nitrite (N+N)	10%	10%	95%
Nitrite (NO_2)	10%	10%	95%
Orthophosphate (P)	10%	10%	95%
Silicate (Si)	10%	10%	95%
Total Dissolved Phosphorus (TDP)	10%	10%	95%
Dissolved Organic Carbon (DOC)	10%	10%	95%
Total Dissolved Nitrogen (TDN)	10%	10%	95%
pH	10%	10%	95%
Chlorophyll	20%	20%	95%
Total Suspended Solids (TSS)	20%	20%	95%

8.2 ACCURACY

Accuracy is the measure of the agreement between an observed value and an accepted reference value or true value.

8.2.1 Field Accuracy

Field accuracy was assessed through use of trip blanks. In order for the accuracy assessment to be relevant, all protocols concerning sample collection, handling, preservation, and holding times must be maintained.

For grab sampling, trip blanks were used to determine if samples collected have been contaminated. Trip blanks consisting of reagent grade deionized water and/or low nutrient seawater (LNSW) were submitted to the analytical laboratory to assess the quality of the data resulting from the field monitoring program.

8.3 PRECISION

Precision is a measure of the variability in the results of replicate measurements due to random error (Lombard, 2001). Random errors are always present due to normal variability in the many factors affecting the measurement results. Precision was determined by the following:

1. Collection and analysis of field duplicates for nutrients, TSS, chlorophyll a, pH and DOC
2. Calculation of the percent relative percent difference (%RPD)
3. Documentation of ongoing field equipment maintenance, calibration and operation

8.3.1 Field Precision

Field precision tests were conducted for grab samples. The precision of grab samples was assessed by the comparison of field duplicates. The relative percent difference (RPD) between the analyte levels measured in the field duplicates was calculated as follows:

$$RPD = \frac{|C_A - C_B|}{0.5(C_A + C_B)} \times 100$$

where C_A = measured concentration of sample
C_B = measured concentration of duplicate sample

8.4 COMPLETENESS

Completeness is a measure of the amount of valid data obtained from the monitoring program compared to the amount of data that were expected. Events that may contribute to reduction in measurement completeness include sample container breakage, inaccessibility to proposed sampling locations, automatic sampler failure, and laboratory equipment failures.

The percent completeness (%C) was determined as follows:

$$\%C = \frac{(M_V)}{(M_P)} \times 100$$

where M_V = number of valid measurements
M_P = number of planned measurements

8.4.1 Laboratory Completeness

Laboratory completeness is a measure of the amount of valid measurements obtained from all samples submitted for each sampling activity. The completeness criterion for all measurements is 95 percent.

8.4.2 Field Completeness

Filed completeness is determined by the number of measurements collected versus the number of measurements planned for collection. The completeness criterion for all measurements and sample collection is 90 percent, but will be influenced by environmental situations that may alter monitoring schedules.

8.5 FIELD QUALITY CONTROL

Table 5a below lists the type and number of quality control samples collected for each parameter during each water quality sampling trip.

Table 5a: Field quality control samples

PARAMETER	Field Cleaned Equipment Blanks	Trip blanks	Field Duplicates (10% of total)
Chlorophyll a	1	1	49
TSS	1	1	5
Ammonia	1	1	5
Nitrite	1	1	5
Nitrate+Nitrite	1	1	5
Orthophosphate	1	1	5
Silicate	1	1	5
pH	0	0	5
Dissolved Organic Carbon	0	0	5
Total Dissolved Phosphorus	0	0	5
Total Dissolved Nitrogen	0	0	5

8.6 LABORATORY QUALITY CONTROL

The MDL's, preservation and holding times are listed in Table 5b.

Table 5b: Laboratory minimum detection limits, number of samples and preservative.

Analyte	Sample Matrix	Number of Samples/Month	MDL	Preservative
Chlorophyll a	NA	49	0.05 µg/L	Liquid N
TSS	Total	49	0.1 mg/L	4^0C; 7 days
NH4	Dissolved	49	0.3 µg N/L	Chloroform; ASAP
NO2	Dissolved	49	0.075 µg N/L	Freezing; 2 weeks
N+N	Dissolved	49	0.075 µg N/L	Freezing; 2 weeks
P	Dissolved	49	0.7 µg P/L	Freezing; 2 months
Si	Dissolved	49	1.2 µg Si/L	Freezing; 2 months
pH	NA	49	0.004 pH units	4^0C; ASAP
DOC	Dissolved	49	4 µg C/L	Freezing, 2 months
TDP	Total dissolved	49	0.3 µg P/L	Freezing; 2 months
TDN	Total dissolved	49	4 µg N/L	Freezing; 2 months

9.0 DATA SUMMARY

9.1 JUNE 2007

Water quality monitoring was conducted on June 5th and 6th, 2007 from the RV Cable. All stations were sampled for all water quality parameters listed in Table 2, except for the vertical profiles of the water column. The ADV YSI could only sample every minute, which made it impossible to conduct vertical profiles. Separate salinity samples were collected from each Niskin bottle in order to have a salinity value for each depth sampled. A trip and equipment blank were collected for the cruise. The times and dates of sample collection are listed in Table 6. The water quality data is listed below in Tables 7-9.

The tides on June 5, 2007 were at (01:22; 13:29) High and (08:01; 20:15) Low. June 6, 2007 tides were at (02:06, 14:21) High and (08:51, 21:09) Low. Sea conditions were 2 feet or less, except for June 5th when seas became over 2 feet during late afternoon and sampling had to be suspended. Heavy rain occurred several days before sampling and during sampling on June 6th. A total of 5 duplicates were collected for each of the water quality parameters. The inlet sample BD-13A was collected on an outgoing tidal cycle. The surface boil of the South Central Outfall was not visible at the surface so the sample was collected at the known coordinates of the outfall. The current was moving in a northerly direction.

The NO_3-N+NO_2-N values ranged from 0.06µM to0.68µM for the reef and outfall areas, while the Boynton Inlet and Lake Worth Lagoon (LWL) ranged from 2.25µM to 21.80µM. The NH_4-N values ranged from 0.48µM to 1.0µM for the reef and outfall while the Boynton Inlet and LWL ranged from 0.48µM to 1.19µM. Ortho-PO_4-P values ranged from below detection limit (BDL) to 0.06µM over the reef and outfall while the Boynton Inlet and LWL ranged from BDL to 0.15µM. SiO_4-Si values ranged from BDL

to 2.0µM over the reef and outfall, while the Boynton Inlet and LWL ranged from 22.0µM to 36.0µM.

Salinity values varied little for the reef and outfall with values ranging from 36.0 to 36.4 salinity units except for station BD-12A which had a salinity value of 33.7 due to possible influence from the Boynton Inlet discharge. The Boynton Inlet and LWL had values which ranged from 9.7 to 21.7 salinity units. The pH values varied slightly with values ranging from 7.96 to 8.01 for the reef and outfall areas, and 7.58 to 7.81 for the Boynton Inlet and LWL. Chlorophyll values ranged from 2.43 to 0.252 µg/L over the reef and outfall, while the Boynton Inlet and LWL ranged from 17.05 to 27.96 µg/L. Total suspended solids (TSS) values varied from 0.04 to 1.13 mg/L over the reef and outfall areas, while the Boynton Inlet and LWL ranged from 3.72 to 4.88 mg/L. Station 12A had a much higher value of chlorophyll and TSS possibly from the influence of the discharge from the Boynton Inlet.

Table 6: Date and Time of water sample collection for June 2007.

Date	Time (Local)	Station	Latitude	Longitude	Depth (m)
6/5/2007	10:17	BD-1A	26.42550	-80.04545	0
6/5/2007	10:17	BD-1B	26.42550	-80.04545	16
6/5/2007	10:17	BD-1C	26.42550	-80.04545	35
6/5/2007	10:55	BD-2A	26.44201	-80.04729	0
6/5/2007	10:55	BD-2B	26.44201	-80.04729	8
6/5/2007	10:55	BD-2C	26.44201	-80.04729	16
6/5/2007	11:37	BD-3A	26.45828	-80.04247	0
6/5/2007	11:37	BD-3B	26.45828	-80.04247	16
6/5/2007	11:37	BD-3C	26.45828	-80.04247	33
6/5/2007	12:16	BD-4A	26.46192	-80.04195	0
6/5/2007	12:16	BD-4B	26.46192	-80.04195	16
6/5/2007	12:16	BD-4C	26.46192	-80.04195	32
6/5/2007	13:00	BD-5A	26.46620	-80.04167	0
6/5/2007	13:00	BD-5B	26.46620	-80.04167	15
6/5/2007	13:00	BD-5C	26.46620	-80.04167	30
6/5/2007	13:35	BD-6A	26.47532	-80.03976	0
6/5/2007	13:35	BD-6B	26.47532	-80.03976	15
6/5/2007	13:35	BD-6C	26.47532	-80.03976	30
6/5/2007	14:05	BD-7A	26.48737	-80.03871	0
6/5/2007	14:05	BD-7B	26.48737	-80.03871	10
6/5/2007	14:05	BD-7C	26.48737	-80.03871	20
6/6/2007	7:54	BD-8A	26.51507	-80.03542	0
6/6/2007	7:54	BD-8B	26.51507	-80.03542	10
6/6/2007	7:54	BD-8C	26.51507	-80.03542	20
6/6/2007	8:40	BD-9A	26.50838	-80.04129	0
6/6/2007	8:40	BD-9B	26.50838	-80.04129	7
6/6/2007	8:40	BD-9C	26.50838	-80.04129	15
6/6/2007	9:08	BD-10A	26.52261	-80.03223	0
6/6/2007	9:08	BD-10B	26.52261	-80.03223	8
6/6/2007	9:08	BD-10C	26.52261	-80.03223	16
6/6/2007	9:41	BD-11A	26.53333	-80.03584	0
6/6/2007	9:41	BD-11B	26.53333	-80.03584	7
6/6/2007	9:41	BD-11C	26.53333	-80.03584	13
6/6/2007	10:04	BD-12A	26.53874	-80.03980	0
6/6/2007	10:04	BD-12B	26.53874	-80.03980	5
6/6/2007	10:04	BD-12C	26.53874	-80.03980	8
6/6/2007	15:00	BD-13A	26.54542	-80.04300	0
6/6/2007	10:40	BD-14A	26.54242	-80.03996	0
6/6/2007	10:40	BD-14C	26.54242	-80.03996	3
6/6/2007	11:04	BD-15A	26.55919	-80.03329	0
6/6/2007	11:04	BD-15B	26.55919	-80.03329	6
6/6/2007	11:04	BD-15C	26.55919	-80.03329	13
6/6/2007	14:24	BD-16A	26.54618	-80.04791	0
6/6/2007	14:10	BD-17A	26.54264	-80.04790	0
6/6/2007	13:53	BD-18A	26.53950	-80.04951	0

Table 7: June 2007 Boynton-Delray nutrient values in µM.

Station	Depth (m)	N+N (µM)	NH4 (µM)	P (µM)	Si (µM)
BD-1A	0	0.50	0.72	0.01	0.00
BD-1B	16	0.51	0.67	0.00	0.05
BD-1C	35	0.68	0.75	BDL	0.33
BD-2A	0	0.18	0.97	BDL	BDL
BD-2B	8	0.18	0.53	BDL	BDL
BD-2C	16	0.31	0.99	BDL	BDL
BD-3A	0	0.42	1.00	BDL	BDL
BD-3B	16	0.39	0.96	BDL	BDL
BD-3C	33	0.31	0.54	BDL	0.23
BD-4A	0	0.38	0.59	BDL	BDL
BD-4B	16	0.18	0.49	BDL	BDL
BD-4C	32	0.30	0.64	BDL	0.12
BD-5A	0	0.26	0.75	BDL	BDL
BD-5B	15	0.20	0.70	BDL	BDL
BD-5C	30	0.28	0.62	BDL	0.10
BD-6A	0	0.18	0.58	BDL	0.05
BD-6B	15	0.17	0.81	BDL	BDL
BD-6C	30	0.30	0.66	BDL	0.12
BD-7A	0	0.21	0.62	BDL	BDL
BD-7B	10	0.09	0.77	BDL	BDL
BD-7C	20	0.12	0.55	BDL	BDL
BD-8A	0	0.06	0.72	BDL	BDL
BD-8B	10	0.08	0.71	BDL	BDL
BD-8C	20	0.12	0.71	BDL	BDL
BD-9A	0	0.09	0.61	BDL	BDL
BD-9B	7	0.07	0.65	0.01	BDL
BD-9C	15	0.10	0.69	0.02	BDL
BD-10A	0	0.09	0.63	0.06	BDL
BD-10B	8	0.12	0.58	BDL	BDL
BD-10C	16	0.36	0.67	0.02	BDL
BD-11A	0	0.11	0.48	BDL	BDL
BD-11B	7	0.06	0.63	0.05	BDL
BD-11C	13	0.08	0.63	BDL	BDL
BD-12A	0	0.29	0.77	BDL	2.00
BD-12B	5	0.06	0.51	BDL	BDL
BD-12C	8	0.09	0.65	BDL	BDL
BD-13A	0	2.25	0.48	0.05	22.00
BD-14A	0	0.08	0.54	BDL	0.16
BD-14C	3	0.07	0.66	BDL	0.06
BD-15A	0	0.14	0.67	BDL	0.92
BD-15B	6	0.06	0.56	BDL	BDL
BD-15C	13	0.06	0.57	BDL	BDL
BD-16A	0	2.50	0.60	BDL	26.20
BD-17A	0	21.80	0.34	0.11	31.10
BD-18A	0	3.90	1.19	0.15	36.00

Table 8: June 2007 Boynton-Delray nutrient values in mg/L

Station	Depth (m)	N+N (mg/L)	NH4 (mg/L)	P (mg/L)	Si (mg/L)
BD-1A	0	0.007	0.010	BDL	BDL
BD-1B	16	0.007	0.009	BDL	0.001
BD-1C	35	0.010	0.011	BDL	0.009
BD-2A	0	0.003	0.014	BDL	BDL
BD-2B	8	0.003	0.007	BDL	BDL
BD-2C	16	0.004	0.014	BDL	BDL
BD-3A	0	0.006	0.014	BDL	BDL
BD-3B	16	0.005	0.013	BDL	BDL
BD-3C	33	0.004	0.008	BDL	0.006
BD-4A	0	0.005	0.008	BDL	BDL
BD-4B	16	0.003	0.007	BDL	BDL
BD-4C	32	0.004	0.009	BDL	0.003
BD-5A	0	0.004	0.011	BDL	BDL
BD-5B	15	0.003	0.010	BDL	BDL
BD-5C	30	0.004	0.009	BDL	0.003
BD-6A	0	0.003	0.008	BDL	0.001
BD-6B	15	0.002	0.011	BDL	BDL
BD-6C	30	0.004	0.009	BDL	0.003
BD-7A	0	0.003	0.009	BDL	BDL
BD-7B	10	0.001	0.011	BDL	BDL
BD-7C	20	0.002	0.008	BDL	BDL
BD-8A	0	0.001	0.010	BDL	BDL
BD-8B	10	0.001	0.010	BDL	BDL
BD-8C	20	0.002	0.010	BDL	BDL
BD-9A	0	0.001	0.009	BDL	BDL
BD-9B	7	0.001	0.009	BDL	BDL
BD-9C	15	0.001	0.010	0.001	BDL
BD-10A	0	0.001	0.009	0.002	BDL
BD-10B	8	0.002	0.008	BDL	BDL
BD-10C	16	0.005	0.009	0.005	BDL
BD-11A	0	0.002	0.007	BDL	BDL
BD-11B	7	0.001	0.009	0.002	BDL
BD-11C	13	0.001	0.009	BDL	BDL
BD-12A	0	0.004	0.011	BDL	0.056
BD-12B	5	0.001	0.007	BDL	BDL
BD-12C	8	0.001	0.009	BDL	BDL
BD-13A	0	0.032	0.007	0.002	0.616
BD-14A	0	0.001	0.008	BDL	0.004
BD-14C	3	0.001	0.009	BDL	0.002
BD-15A	0	0.002	0.009	BDL	0.026
BD-15B	6	0.001	0.008	BDL	BDL
BD-15C	13	0.001	0.008	BDL	BDL
BD-16A	0	0.035	0.008	BDL	0.734
BD-17A	0	0.305	0.005	0.003	0.871
BD-18A	0	0.055	0.017	0.005	1.008

Table 9: June 2007 Boynton-Delray Salinity, pH, Chlorophyll and TSS results.

Station	Depth (m)	Temperature (^{0}C)	Salinity (Units)	pH (Units)	Chlorophyll a (µg/L)	Phaeopigments (µg/L)	TSS (mg/L)
BD-1A	0	N/A	36.2	7.97	0.394	0.161	0.42
BD-1B	16	N/A	36.3	7.98	0.642	0.258	0.35
BD-1C	35	N/A	36.4	7.97	0.343	0.188	0.26
BD-2A	0	N/A	36.2	8.01	0.448	0.181	0.43
BD-2B	8	N/A	36.2	8.00	0.649	0.263	0.37
BD-2C	16	N/A	36.3	7.99	0.604	0.243	0.39
BD-3A	0	N/A	36.2	7.98	0.486	0.183	0.37
BD-3B	16	N/A	36.2	8.00	0.481	0.170	0.33
BD-3C	33	N/A	36.4	7.99	0.539	0.271	0.25
BD-4A	0	N/A	36.1	8.00	0.523	0.189	0.40
BD-4B	16	N/A	36.2	7.99	0.708	0.269	0.26
BD-4C	32	N/A	36.3	8.00	0.642	0.303	0.36
BD-5A	0	N/A	36.1	8.00	0.664	0.200	0.37
BD-5B	15	N/A	36.2	8.00	N/A	N/A	0.49
BD-5C	30	N/A	36.3	8.00	0.687	0.294	0.32
BD-6A	0	N/A	36.1	8.00	0.735	0.233	0.28
BD-6B	15	N/A	36.2	8.00	0.830	0.272	0.36
BD-6C	30	N/A	36.4	8.00	0.711	0.295	0.32
BD-7A	0	N/A	36.1	8.00	0.744	0.249	0.27
BD-7B	10	N/A	36.3	8.00	0.821	0.289	0.17
BD-7C	20	N/A	36.3	8.01	0.778	0.287	0.39
BD-8A	0	N/A	36.1	8.00	0.292	0.131	0.07
BD-8B	10	N/A	36.3	8.00	0.332	0.152	0.29
BD-8C	20	N/A	36.4	8.00	0.336	0.163	0.04
BD-9A	0	N/A	36.0	8.00	0.609	0.209	0.21
BD-9B	7	N/A	36.2	7.99	0.622	0.271	0.07
BD-9C	15	N/A	36.3	7.96	0.509	0.216	0.33
BD-10A	0	N/A	36.2	8.01	0.268	0.128	0.33
BD-10B	8	N/A	36.3	8.00	0.335	0.146	0.19
BD-10C	16	N/A	36.3	7.99	0.252	0.177	0.07
BD-11A	0	N/A	36.1	8.00	0.550	0.182	0.11
BD-11B	7	N/A	36.3	8.01	0.526	0.168	0.26
BD-11C	13	N/A	36.3	7.99	0.412	0.167	0.26
BD-12A	0	N/A	33.7	7.96	2.427	0.830	1.13
BD-12B	5	N/A	36.1	7.99	0.600	0.246	0.33
BD-12C	8	N/A	36.1	8.00	0.742	0.274	0.33
BD-13A	0	N/A	21.7	7.81	17.047	3.568	3.72
BD-14A	0	N/A	35.6	7.98	0.993	0.334	0.46
BD-14C	3	N/A	35.7	7.98	0.902	0.340	0.41
BD-15A	0	N/A	34.8	7.98	0.702	0.269	0.74
BD-15B	6	N/A	36.2	8.00	0.565	0.173	0.24
BD-15C	13	N/A	36.3	7.97	0.485	0.171	0.23
BD-16A	0	N/A	20.4	7.78	21.489	4.070	4.06
BD-17A	0	N/A	9.7	7.79	25.877	4.183	4.08
BD-18A	0	N/A	10.1	7.58	27.965	4.929	4.88

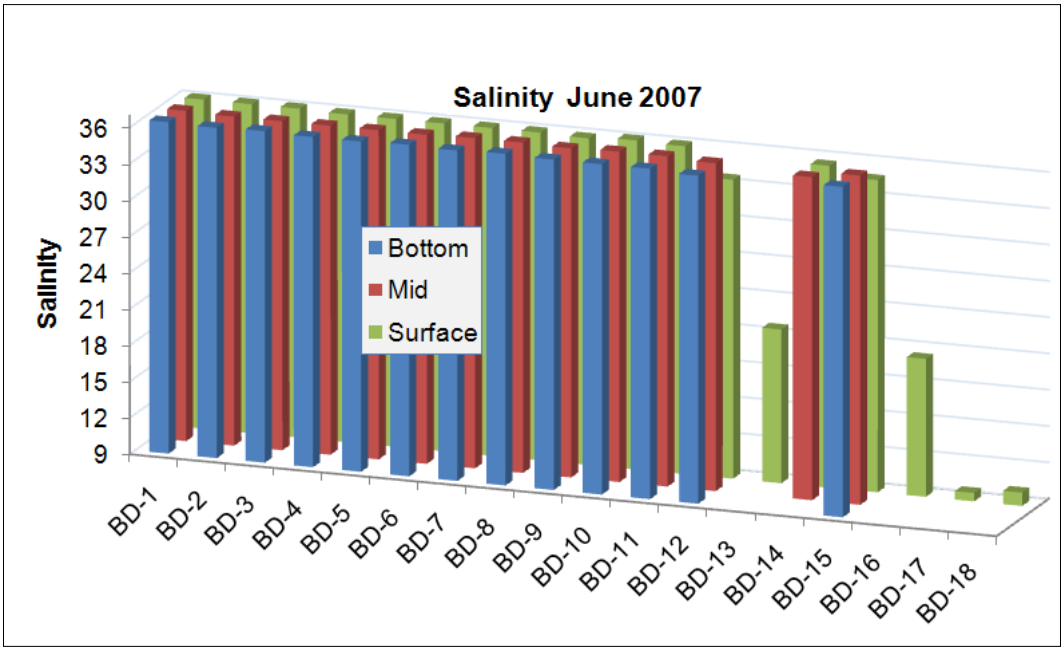

Figure 2: June 2007 salinity values for the Boynton-Delray water quality monitoring stations.

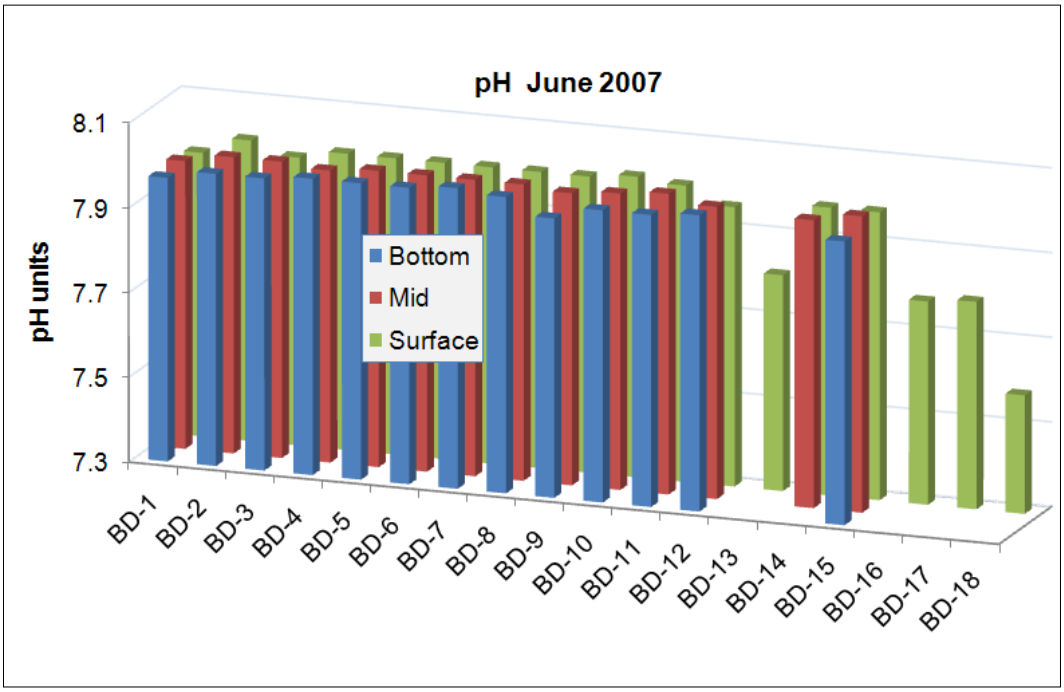

Figure 3: June 2007 pH values for the Boynton-Delray water quality monitoring stations.

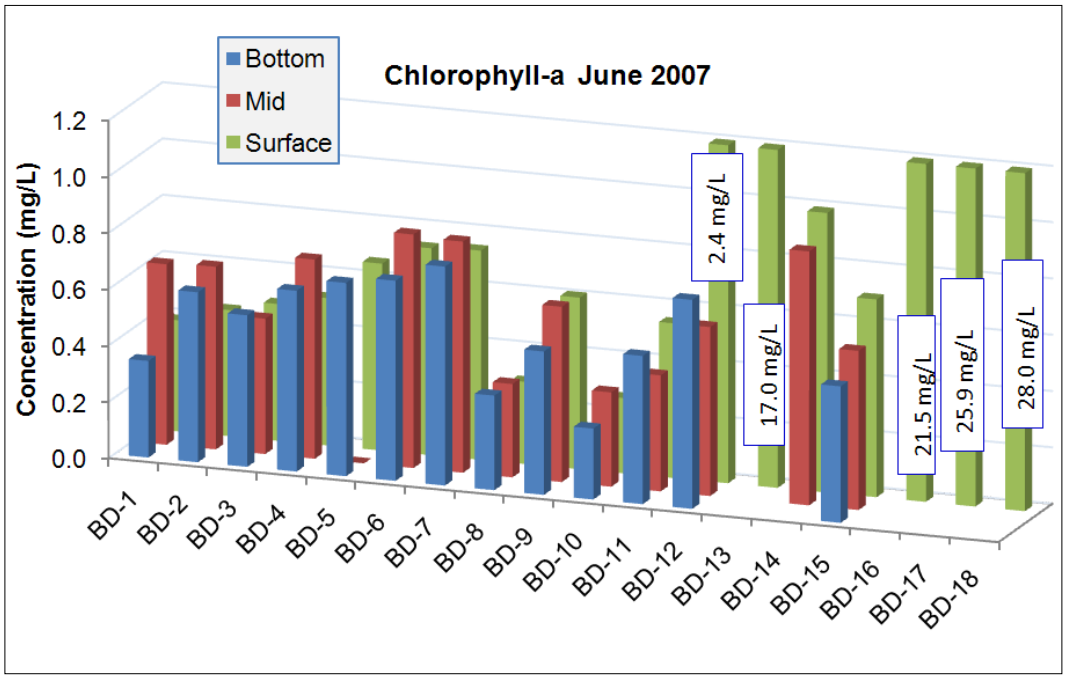

Figure 4: June 2007 chlorophyll values for the Boynton-Delray water quality monitoring stations.

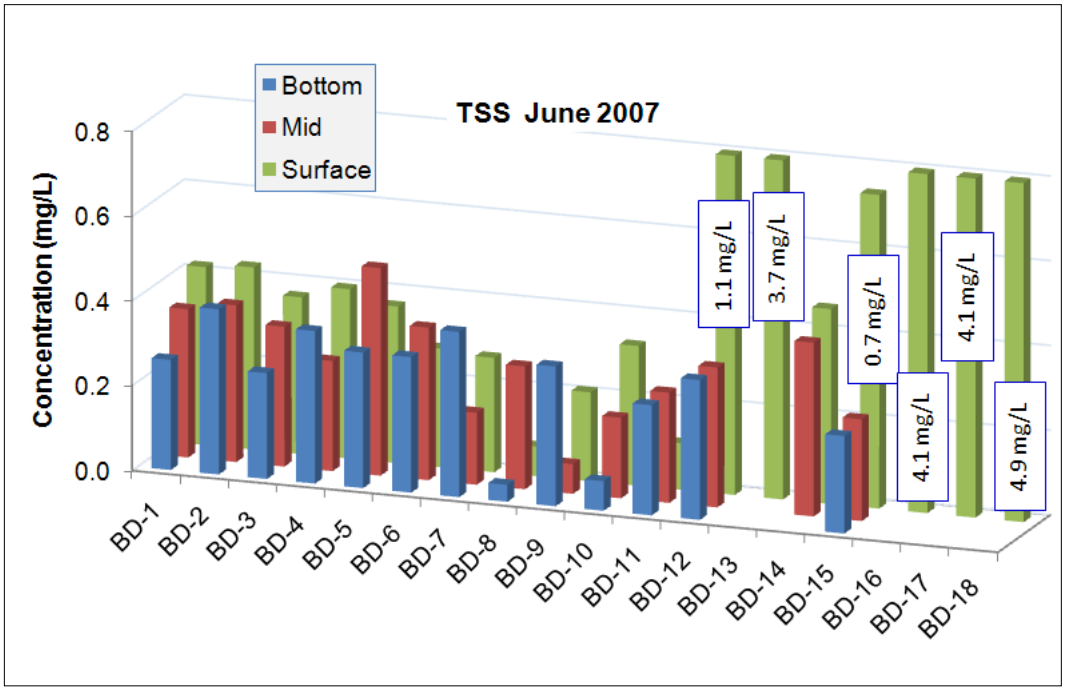

Figure 5: June 2007 total suspended solids values for the Boynton-Delray water quality monitoring stations.

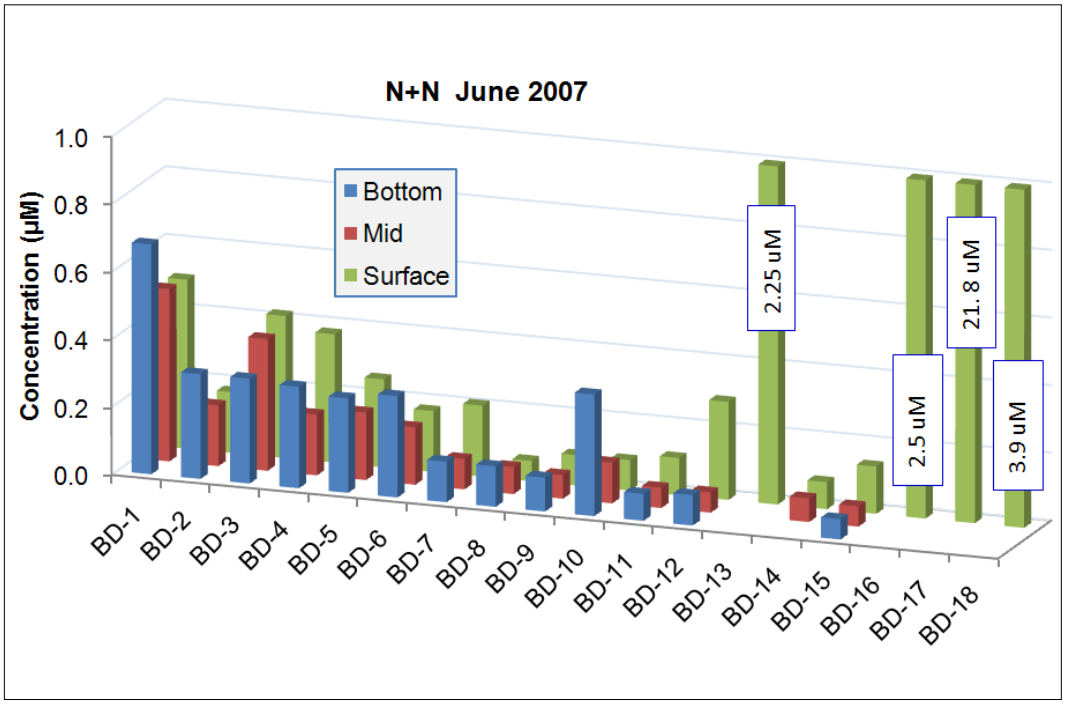

Figure 6: June 2007 N+N values for the Boynton-Delray water quality monitoring stations.

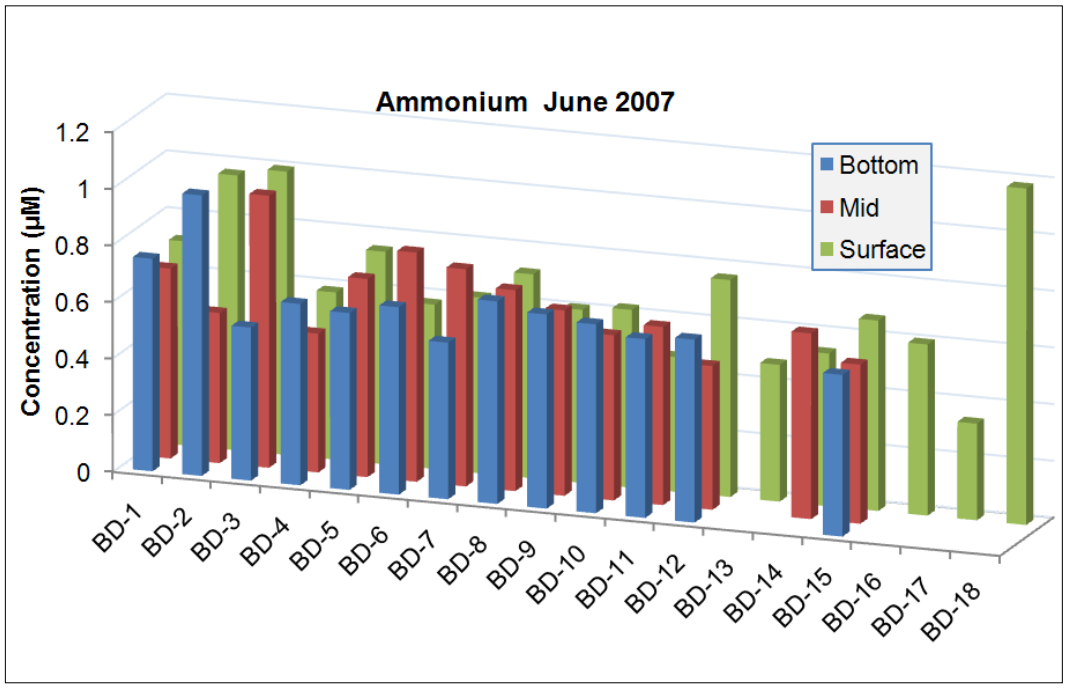

Figure 7: June 2007 NH4 values for the Boynton-Delray water quality monitoringstations.

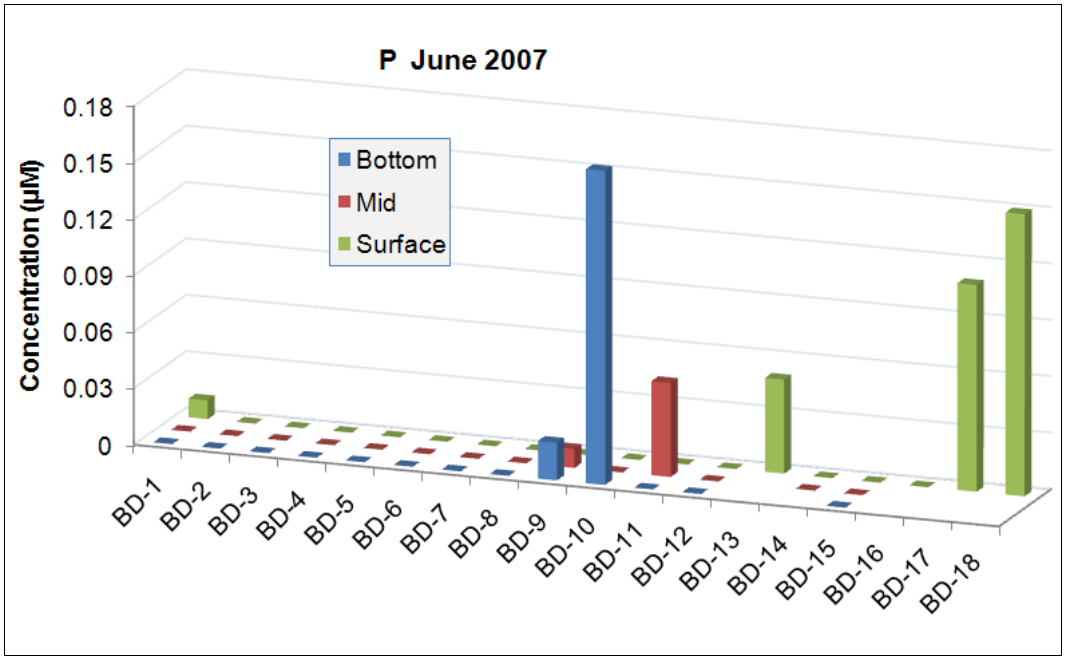

Figure 8: June 2007 P values for the Boynton-Delray water quality monitoring stations.

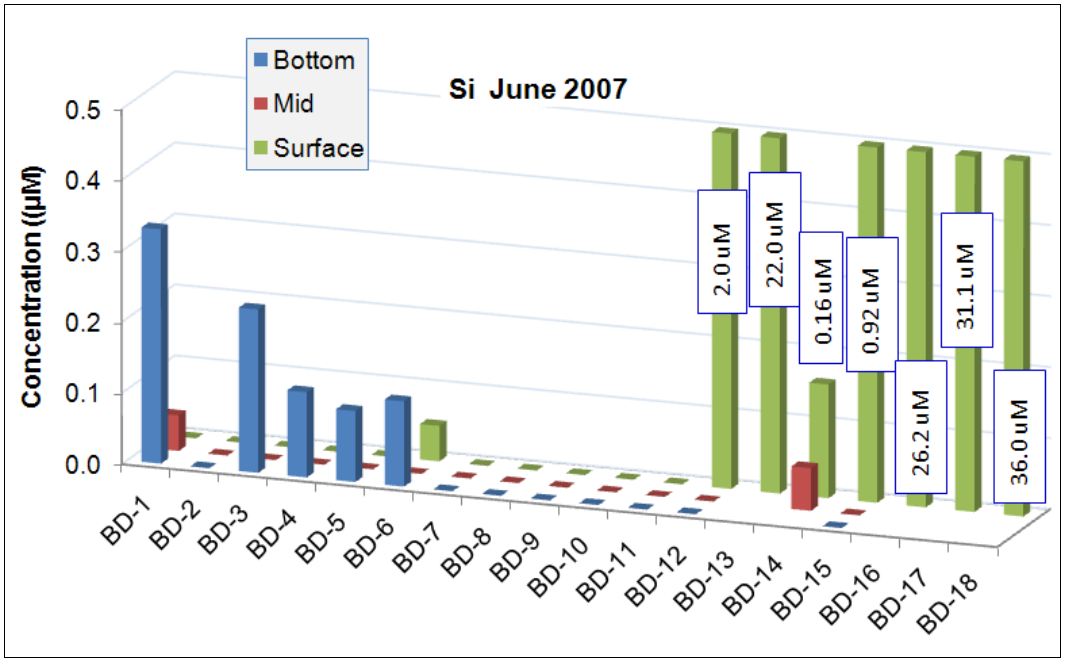

Figure 9: June 2007 Sivalues for the Boynton-Delray water quality monitoring stations.

9.2 AUGUST 2007

Water quality monitoring was conducted on August 28th and 29th, 2007 from the RV Cable. All stations were sampled for all water quality parameters listed in Table 2, except for the vertical profiles of the water column. TheYSI came unattched from the line and was lost so we were unable to conduct vertical profiles. It was later found and returned to AOML. The vertical profiles for stations BD-2 thru BD-4 were ok. Separate salinity samples were collected from each Niskin bottle in order to have a salinity value for each depth sampled. A trip and equipment were collected for the cruise. The times and dates of sample collection are listed in Table 10. The water quality data is listed below in Tables 11-13.

The tides on August 28th were (10:14; 22:40) High and (04:40; 17:01) Low. The tides on August 29th were (11:02; 23:20) High and (5:24; 17:47) Low. Sea conditions were 2-3 feet with the winds ENE at 5-10kts on both days of sampling. A total of 5 duplicates were collected for each of the water quality parameters. The inlet sample BD-13A was collected towards the end of an outgoing tidal cycle. The boil at the South Central Outfall was visible at the surface and the current direction was northerly during both days of water sampling. Subsequent ADCP results (Section 11) indicated that stations 8-15 were sampled in zero or slightly southward current. This may have resulted in lower values in the vicinity of the inlet (stations 12-14).

NO_3-N+NO_2-N values ranged from BDL to 8.0µM for the reef and outfall stations with the surface boil (BD-4A) having the highest value (8.0µM), while the Boynton Inlet and LWL values ranged from 0.03µM to 3.30µM. NH_4-N values from BDL to 22.50µM over the reef and outfall area with the surface boil containing the highest value (22.50µM), while the values ranged from BDL to 0.69µM for the Boynton Inlet and LWL. Ortho-PO_4-P values ranged from BDL to 0.91µM over the reef and outfall with the surface boil having the highest value (0.91µM), while the Boynton Inlet and LWL values ranged from 0.01µM to 0.24µM. SiO_4-Si values ranged from BDL to 4.40µM over the reef and outfall with the surface boil containing the highest value of 4.40µM, while the Boynton Inlet and LWL had values ranging from 0.21µM to 39.10µM. The total dissolved nitrogen (TDN) and total dissolved phosphorus (TDP) values ranged from 0.08µM to 11.0µM and 0.17µM to 1.22µM for the reef and outfall stations, while the Boynton Inlet and LWL values ranged from 4.84µM to 22.36µM and 0.29µM to 0.93µM. The surface boil and just north of the boil had the largest values. Station BD-14C had no nutrient results due to crack in sample tube. Dissolved organic carbon (DOC) values ranged from 37.66µM to 91.62µM for the reef and outfall stations, while the Boynton Inlet and LWL values ranged from 45.42µM to 260.05µM.

Salinity values varied between 34.7 and 36.2 salinity units over the reef and outfall areas with the lowest values occurring near the Boynton Inlet and over the outfall. The salinity in the Boynton Inlet and LWL ranged from 18.4 to 35.8 salinity units. pH values ranged from 8.08 to 8.14 for the reef and outfall stations, while the Boynton Inlet and LWL reported values between 7.94 to 8.10. Chlorophyll values ranged from 1.74µg/L to 0.091µg/L over the reef and outfall, while the Boynton Inlet and LWL ranged from 0.560µg/L to 9.37µg/L. TSS results varied from 0.03mg/l to 0.59mg/L for the reef and

outfall stations, while the Boynton Inlet and LWL values ranged from 0.32mg/L to 2.52mg/L.

Vertical water column profiles were conducted for stations BD-2, BD-3 and BD-4. The YSI unit was lost during retrieval at station BD-4, so no further vertical casts could be conducted. The vertical cast for station BD-1 was no good. No significant variations in the vertical profiles were observed except at station BD-4 where chlorophyll appears to increase between 15 and 25 meters depth.

Table 10: Date and Time of water sample collection for August 2007.

Date	Time (Local)	Station	Latitude	Longitude	Depth (m)
8/28/2007	9:15	BD-1A	26.42550	-80.04545	0
8/28/2007	9:15	BD-1B	26.42550	-80.04545	16
8/28/2007	9:15	BD-1C	26.42550	-80.04545	35
8/28/2007	10:10	BD-2A	26.44201	-80.04729	0
8/28/2007	10:10	BD-2B	26.44201	-80.04729	8
8/28/2007	10:10	BD-2C	26.44201	-80.04729	16
8/28/2007	10:45	BD-3A	26.45828	-80.04247	0
8/28/2007	10:45	BD-3B	26.45828	-80.04247	16
8/28/2007	10:45	BD-3C	26.45828	-80.04247	33
8/28/2007	11:30	BD-4A	26.46192	-80.04195	0
8/28/2007	11:30	BD-4B	26.46192	-80.04195	16
8/28/2007	11:30	BD-4C	26.46192	-80.04195	32
8/28/2007	12:36	BD-5A	26.46620	-80.04167	0
8/28/2007	12:36	BD-5B	26.46620	-80.04167	15
8/28/2007	12:36	BD-5C	26.46620	-80.04167	30
8/28/2007	13:11	BD-6A	26.47532	-80.03976	0
8/28/2007	13:11	BD-6B	26.47532	-80.03976	15
8/28/2007	13:11	BD-6C	26.47532	-80.03976	30
8/28/2007	13:30	BD-7A	26.48737	-80.03871	0
8/28/2007	13:30	BD-7B	26.48737	-80.03871	10
8/28/2007	13:30	BD-7C	26.48737	-80.03871	20
8/28/2007	14:10	BD-8A	26.51507	-80.03542	0
8/28/2007	14:10	BD-8B	26.51507	-80.03542	10
8/28/2007	14:10	BD-8C	26.51507	-80.03542	20
8/28/2007	14:40	BD-9A	26.50838	-80.04129	0
8/28/2007	14:40	BD-9B	26.50838	-80.04129	7
8/28/2007	14:40	BD-9C	26.50838	-80.04129	15
8/28/2007	15:05	BD-10A	26.52261	-80.03223	0
8/28/2007	15:05	BD-10B	26.52261	-80.03223	8
8/28/2007	15:05	BD-10C	26.52261	-80.03223	16
8/28/2007	15:30	BD-11A	26.53333	-80.03584	0
8/28/2007	15:30	BD-11B	26.53333	-80.03584	7
8/28/2007	15:30	BD-11C	26.53333	-80.03584	13
8/29/2007	8:10	BD-12A	26.53874	-80.03980	0
8/29/2007	8:10	BD-12B	26.53874	-80.03980	5
8/29/2007	8:10	BD-12C	26.53874	-80.03980	8
8/28/2007	16:00	BD-13A	26.54542	-80.04300	0
8/29/2007	8:45	BD-14A	26.54242	-80.03996	0
8/29/2007	8:45	BD-14C	26.54242	-80.03996	3
8/29/2007	8:56	BD-15A	26.55919	-80.03329	0
8/29/2007	8:56	BD-15B	26.55919	-80.03329	6
8/29/2007	8:56	BD-15C	26.55919	-80.03329	13
8/29/2007	9:20	BD-16A	26.54618	-80.04791	0
8/29/2007	9:35	BD-17A	26.54264	-80.04790	0
8/29/2007	9:50	BD-18A	26.53950	-80.04951	0

Table 11: August 2007 Boynton-Delray nutrient and DOC values in µM.

Station	Depth (m)	N+N (µM)	NH4 (µM)	P (µM)	Si (µM)	TDN (µM)	TDP (µM)	DOC (µM)
BD-1A	0	0.07	0.51	BDL	BDL	0.09	0.24	91.62
BD-1B	16	0.02	0.14	BDL	BDL	0.11	0.17	49.44
BD-1C	35	0.19	BDL	BDL	BDL	0.11	0.19	44.80
BD-2A	0	0.02	0.05	BDL	BDL	0.12	0.18	47.92
BD-2B	8	0.04	0.06	BDL	BDL	0.09	0.17	47.98
BD-2C	16	0.45	0.07	0.02	BDL	0.10	0.20	43.40
BD-3A	0	1.80	5.70	0.21	BDL	0.11	0.42	55.18
BD-3B	16	0.01	BDL	BDL	BDL	0.08	0.19	44.68
BD-3C	33	0.21	0.07	0.01	BDL	0.09	0.20	41.73
BD-4A	0	8.00	22.50	0.91	4.40	0.08	1.22	66.84
BD-4B	16	0.05	BDL	0.02	0.74	6.18	0.17	44.62
BD-4C	32	0.68	0.19	0.05	0.88	7.72	0.19	47.06
BD-5A	0	0.02	BDL	0.01	0.77	7.57	0.17	49.38
BD-5B	15	0.56	0.89	0.02	0.77	11.00	0.26	48.00
BD-5C	30	0.28	1.20	0.01	0.60	8.97	0.22	44.20
BD-6A	0	BDL	0.16	0.01	0.06	9.29	0.23	49.86
BD-6B	15	0.05	0.11	BDL	BDL	10.53	0.22	44.99
BD-6C	30	0.41	0.15	BDL	BDL	8.09	0.21	43.99
BD-7A	0	0.03	BDL	BDL	BDL	8.89	0.17	50.07
BD-7B	10	BDL	BDL	BDL	BDL	7.69	0.18	52.02
BD-7C	20	0.28	0.02	0.02	BDL	7.44	0.18	38.90
BD-8A	0	0.06	BDL	BDL	BDL	5.53	0.16	40.57
BD-8B	10	0.01	0.79	BDL	BDL	11.15	0.16	37.66
BD-8C	20	BDL	0.28	BDL	0.48	5.36	0.21	39.32
BD-9A	0	BDL	0.15	BDL	0.36	5.01	0.21	40.99
BD-9B	7	0.51	0.08	0.10	0.34	4.59	0.19	40.24
BD-9C	15	0.01	0.10	BDL	0.27	2.36	0.18	41.33
BD-10A	0	BDL	0.12	BDL	2.40	6.48	0.33	56.61
BD-10B	8	BDL	0.05	BDL	0.30	10.55	0.13	41.12
BD-10C	16	0.02	BDL	BDL	0.23	7.06	0.17	43.96
BD-11A	0	0.02	BDL	BDL	2.90	7.34	0.25	59.53
BD-11B	7	0.01	BDL	BDL	0.11	7.52	0.27	43.79
BD-11C	13	0.09	BDL	BDL	0.07	7.66	0.20	41.24
BD-12A	0	BDL	BDL	BDL	0.66	25.41	0.78	87.71
BD-12B	5	0.02	BDL	BDL	0.64	6.34	0.33	52.26
BD-12C	8	0.06	BDL	BDL	0.25	5.18	0.22	45.00
BD-13A	0	0.08	BDL	0.02	9.60	9.46	0.19	115.22
BD-14A	0	0.05	BDL	BDL	0.64	5.36	0.19	46.92
BD-14C	3	N/A	N/A	N/A	N/A	6.07	0.18	45.63
BD-15A	0	BDL	BDL	BDL	BDL	4.25	0.18	42.79
BD-15B	6	0.05	BDL	BDL	BDL	6.68	0.24	45.25
BD-15C	13	BDL	BDL	BDL	BDL	4.16	0.18	42.04
BD-16A	0	0.03	BDL	0.01	0.21	4.84	0.21	45.42
BD-17A	0	3.30	0.69	0.24	17.00	15.84	0.80	132.47
BD-18A	0	0.61	0.17	0.10	39.10	22.36	0.93	260.05

Table 12: August 2007 Boynton-Delray nutrient and DOC values in mg/L.

Station	Depth (m)	N+N (mg/L)	NH4 (mg/L)	P (mg/L)	Si (mg/L)	TDN (mg/L)	TDP (mg/L)	DOC (mg/L)
BD-1A	0	0.001	0.007	BDL	BDL	0.15	0.007	1.79
BD-1B	16	BDL	0.002	BDL	BDL	0.09	0.005	1.10
BD-1C	35	0.003	BDL	BDL	BDL	0.09	0.006	1.03
BD-2A	0	BDL	0.001	BDL	BDL	0.09	0.006	1.08
BD-2B	8	0.001	0.001	BDL	BDL	0.12	0.005	1.08
BD-2C	16	0.006	0.001	0.001	BDL	0.10	0.006	1.00
BD-3A	0	0.025	0.080	0.007	BDL	0.24	0.013	1.20
BD-3B	16	BDL	BDL	BDL	BDL	0.10	0.006	1.03
BD-3C	33	0.003	0.001	BDL	BDL	0.12	0.006	0.98
BD-4A	0	0.112	0.315	0.028	0.123	0.57	0.038	1.39
BD-4B	16	0.001	BDL	0.001	0.021	0.09	0.005	1.02
BD-4C	32	0.010	0.003	0.002	0.025	0.11	0.006	1.06
BD-5A	0	BDL	BDL	BDL	0.022	0.11	0.005	1.10
BD-5B	15	0.008	0.012	0.001	0.022	0.12	0.008	1.20
BD-5C	30	0.004	0.017	BDL	0.017	0.09	0.007	1.13
BD-6A	0	BDL	0.002	BDL	0.002	0.10	0.007	1.23
BD-6B	15	0.001	0.002	BDL	BDL	0.11	0.007	1.14
BD-6C	30	0.006	0.002	BDL	BDL	0.08	0.007	1.12
BD-7A	0	BDL	BDL	BDL	BDL	0.09	0.005	1.24
BD-7B	10	BDL	BDL	BDL	BDL	0.08	0.006	1.27
BD-7C	20	0.004	BDL	0.001	BDL	0.14	0.006	1.01
BD-8A	0	0.001	BDL	BDL	BDL	0.10	0.005	1.05
BD-8B	10	BDL	0.011	BDL	BDL	0.21	0.005	0.98
BD-8C	20	BDL	0.004	BDL	0.013	0.10	0.007	1.02
BD-9A	0	BDL	0.002	BDL	0.010	0.09	0.007	1.06
BD-9B	7	0.007	0.001	0.003	0.010	0.09	0.006	1.04
BD-9C	15	BDL	0.001	BDL	0.008	0.04	0.006	1.06
BD-10A	0	BDL	0.002	BDL	0.067	0.12	0.010	1.43
BD-10B	8	BDL	0.001	BDL	0.008	0.20	0.004	1.06
BD-10C	16	BDL	BDL	BDL	0.006	0.13	0.005	1.13
BD-11A	0	BDL	BDL	BDL	0.081	0.14	0.008	1.50
BD-11B	7	BDL	BDL	BDL	0.003	0.14	0.008	1.12
BD-11C	13	0.001	BDL	BDL	0.002	0.15	0.006	1.06
BD-12A	0	BDL	BDL	BDL	0.018	0.48	0.024	2.17
BD-12B	5	BDL	BDL	BDL	0.018	0.12	0.010	1.33
BD-12C	8	0.001	BDL	BDL	0.007	0.10	0.007	1.15
BD-13A	0	0.001	BDL	0.001	0.269	0.18	0.006	2.83
BD-14A	0	0.001	BDL	BDL	0.018	0.10	0.006	1.20
BD-14C	3	N/A	N/A	N/A	N/A	0.12	0.005	1.17
BD-15A	0	BDL	BDL	BDL	BDL	0.08	0.006	1.10
BD-15B	6	0.001	BDL	BDL	BDL	0.13	0.007	1.16
BD-15C	13	BDL	BDL	BDL	BDL	0.08	0.006	1.08
BD-16A	0	BDL	BDL	BDL	0.006	0.09	0.006	1.16
BD-17A	0	0.046	0.010	0.007	0.476	0.30	0.025	3.25
BD-18A	0	0.009	0.002	0.003	1.095	0.42	0.029	6.30

Table 13: August 2007 Boynton-Delray Salinity, pH, Chlorophyll and TSS results.

Station	Depth (m)	Temperature (^{0}C)	Salinity (Units)	pH (Units)	Chlorophyll a (µg/L)	Phaeopigments (µg/L)	TSS (mg/L)
BD-1A	0	N/A	36.1	8.10	0.206	0.040	0.33
BD-1B	16	N/A	36.2	8.16	0.094	0.032	0.09
BD-1C	35	N/A	36.3	8.09	0.268	0.118	0.21
BD-2A	0	N/A	36.1	8.11	0.160	0.044	0.03
BD-2B	8	N/A	36.2	8.10	0.135	0.045	0.15
BD-2C	16	N/A	36.2	8.10	0.209	0.102	0.15
BD-3A	0	N/A	35.9	8.11	0.168	0.047	0.20
BD-3B	16	N/A	36.2	8.13	0.091	0.020	0.25
BD-3C	33	N/A	36.2	8.12	0.232	0.103	0.05
BD-4A	0	N/A	35.1	8.08	0.164	0.060	0.44
BD-4B	16	N/A	36.2	8.12	0.099	0.028	0.24
BD-4C	32	N/A	36.2	8.10	0.149	0.111	0.15
BD-5A	0	N/A	36.2	8.11	0.111	0.023	0.09
BD-5B	15	N/A	36.2	8.12	0.158	0.079	0.15
BD-5C	30	N/A	36.4	8.08	0.472	0.209	0.23
BD-6A	0	N/A	36.1	8.13	0.241	0.019	0.20
BD-6B	15	N/A	36.2	8.12	0.270	0.089	0.08
BD-6C	30	N/A	36.4	8.10	0.564	0.220	0.19
BD-7A	0	N/A	36.2	8.13	0.370	0.061	0.09
BD-7B	10	N/A	36.2	8.12	0.102	0.033	0.09
BD-7C	20	N/A	36.2	8.12	0.138	0.042	0.05
BD-8A	0	N/A	36.2	8.12	0.161	0.021	0.20
BD-8B	10	N/A	36.2	8.11	0.137	0.031	0.20
BD-8C	20	N/A	36.2	8.12	0.142	0.040	0.31
BD-9A	0	N/A	36.2	8.13	0.157	0.025	0.31
BD-9B	7	N/A	36.1	8.14	0.188	0.094	0.21
BD-9C	15	N/A	36.1	8.12	0.280	0.070	0.24
BD-10A	0	N/A	35.0	8.09	1.468	0.323	0.44
BD-10B	8	N/A	36.1	8.12	0.145	0.021	0.21
BD-10C	16	N/A	36.2	8.11	0.122	0.037	0.23
BD-11A	0	N/A	34.7	8.06	1.744	0.398	0.39
BD-11B	7	N/A	36.1	8.09	0.229	0.058	0.25
BD-11C	13	N/A	36.2	8.10	0.342	0.096	0.03
BD-12A	0	N/A	35.7	8.14	0.625	0.236	0.01
BD-12B	5	N/A	35.7	8.13	0.665	0.202	0.59
BD-12C	8	N/A	35.9	8.13	0.513	0.150	0.31
BD-13A	0	N/A	30.4	8.10	6.075	1.169	0.52
BD-14A	0	N/A	35.5	8.13	0.656	0.183	0.31
BD-14C	3	N/A	35.8	8.13	0.610	0.177	0.35
BD-15A	0	N/A	36.1	8.12	0.203	0.064	0.25
BD-15B	6	N/A	36.1	8.14	0.398	0.081	0.19
BD-15C	13	N/A	36.2	8.14	0.210	0.066	0.21
BD-16A	0	N/A	35.8	8.10	0.560	0.178	0.32
BD-17A	0	N/A	26.9	7.97	1.945	0.795	0.14
BD-18A	0	N/A	18.4	7.94	9.367	4.108	2.52

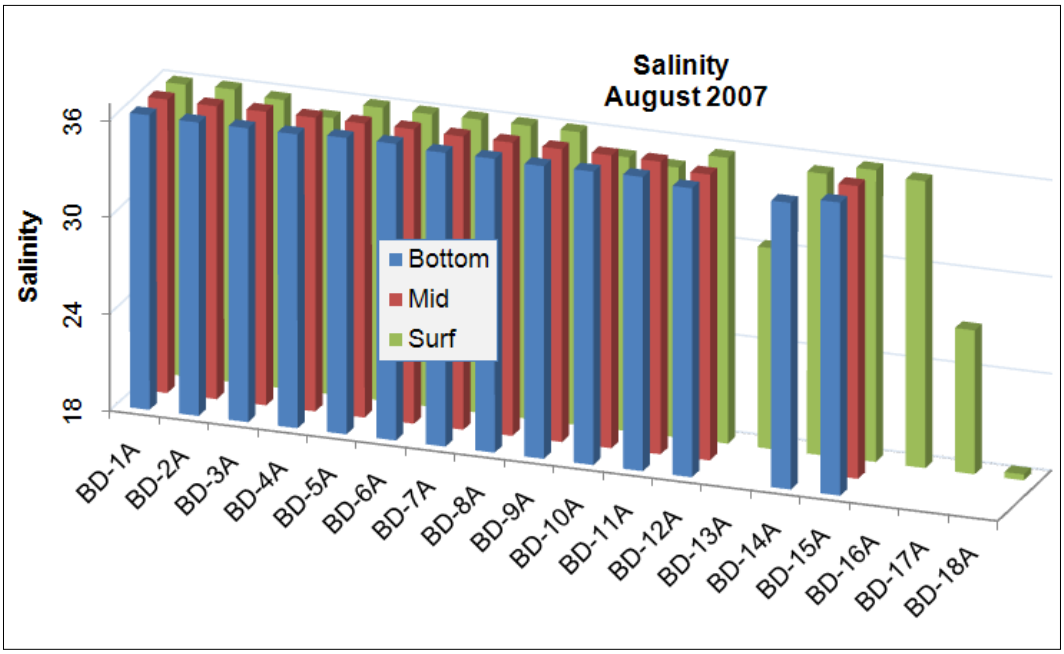

Figure 10: August 2007 salinity results for the Boynton-Delray water quality monitoring stations.

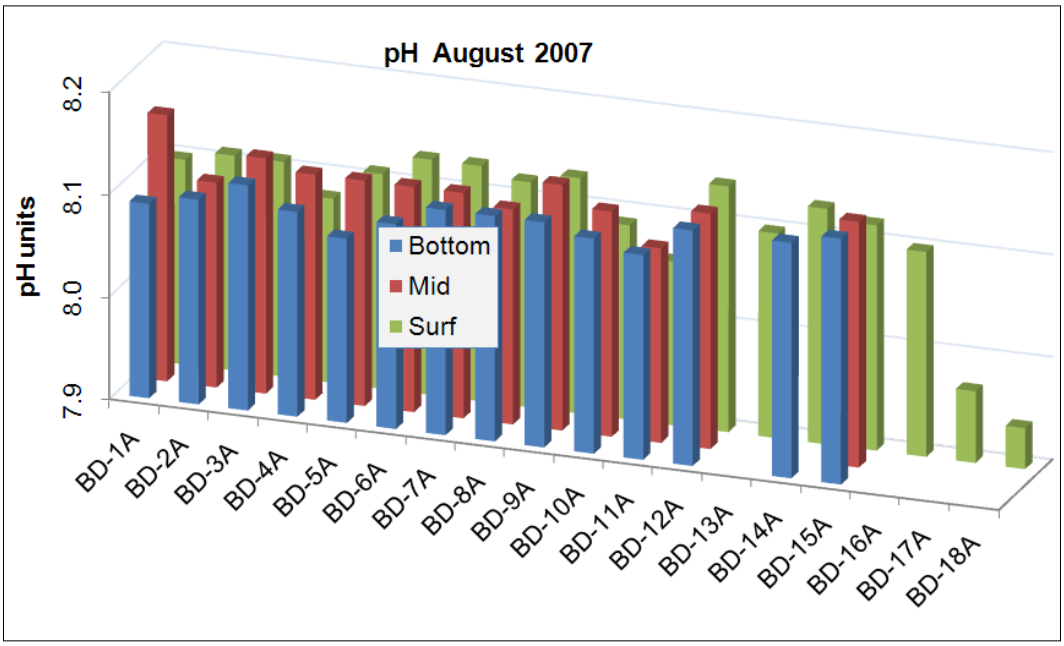

Figure 11: August 2007 pH measurements for the Boynton-Delray water quality monitoring stations.

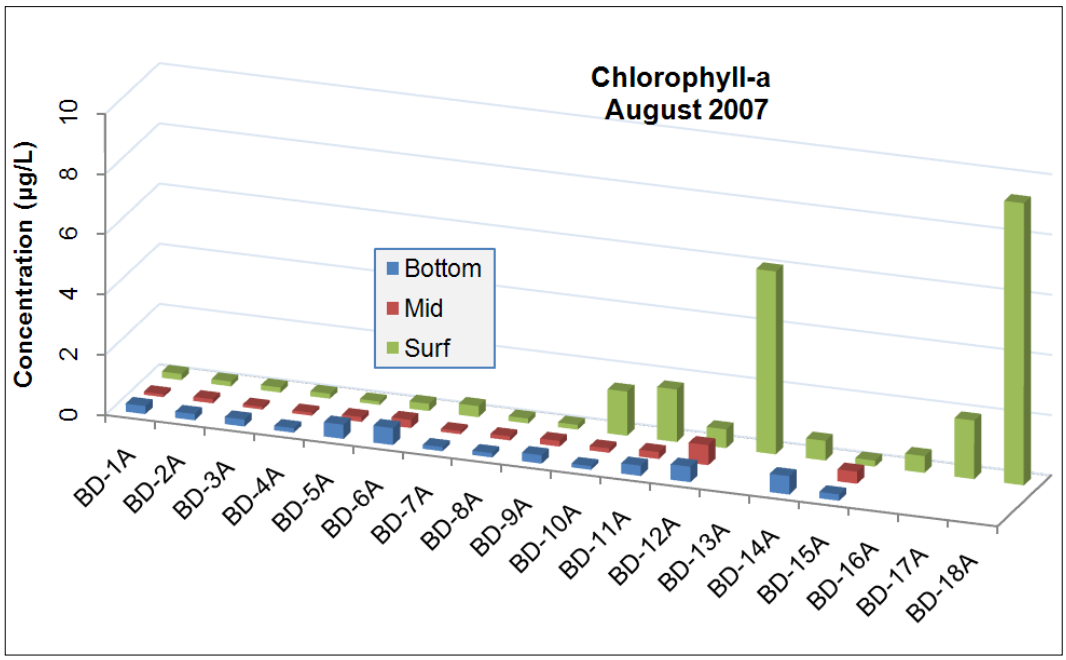

Figure 12: August 2007 chlorophyll concentrations for the Boynton-Delray water quality monitoring stations.

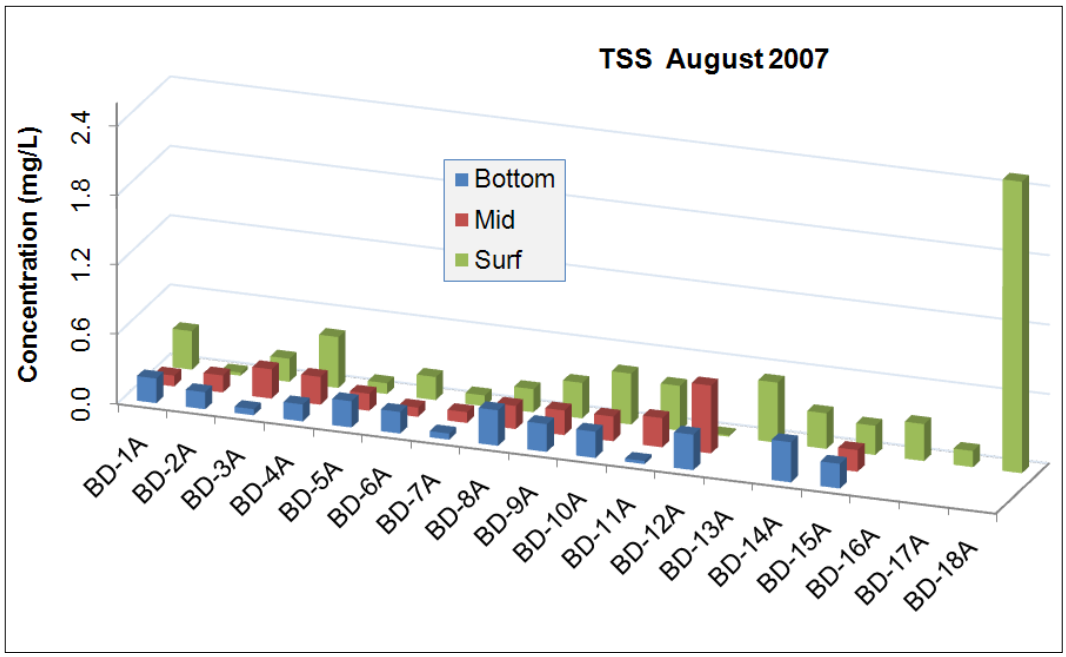

Figure 13: August 2007 total suspended solids concentrations for the Boynton-Delray water quality monitoring stations.

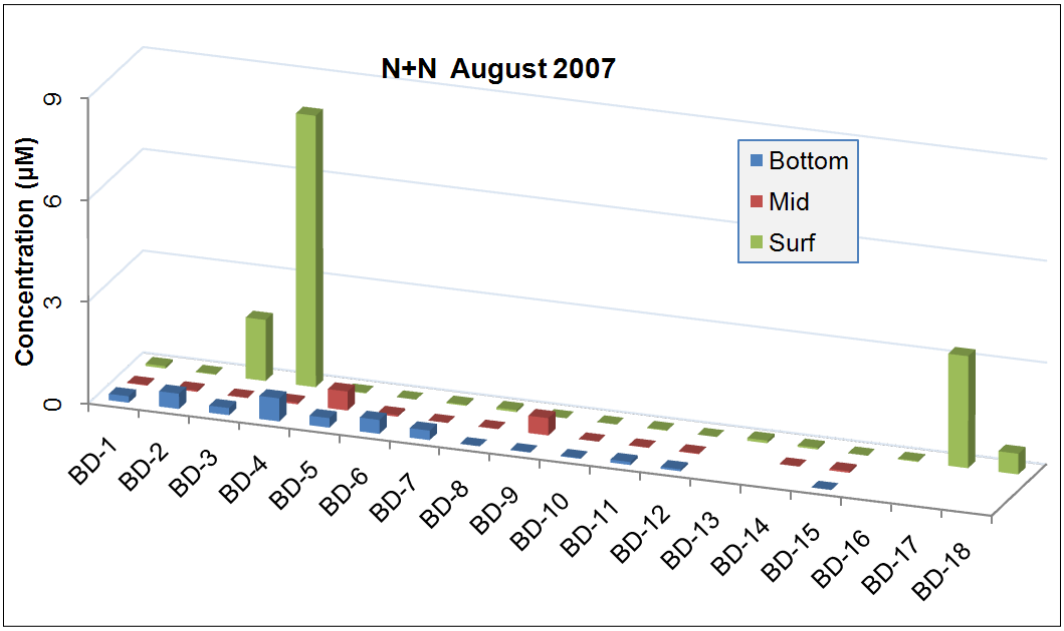

Figure 14: August 2007 N+N concentrations for the Boynton-Delray water quality monitoring stations.

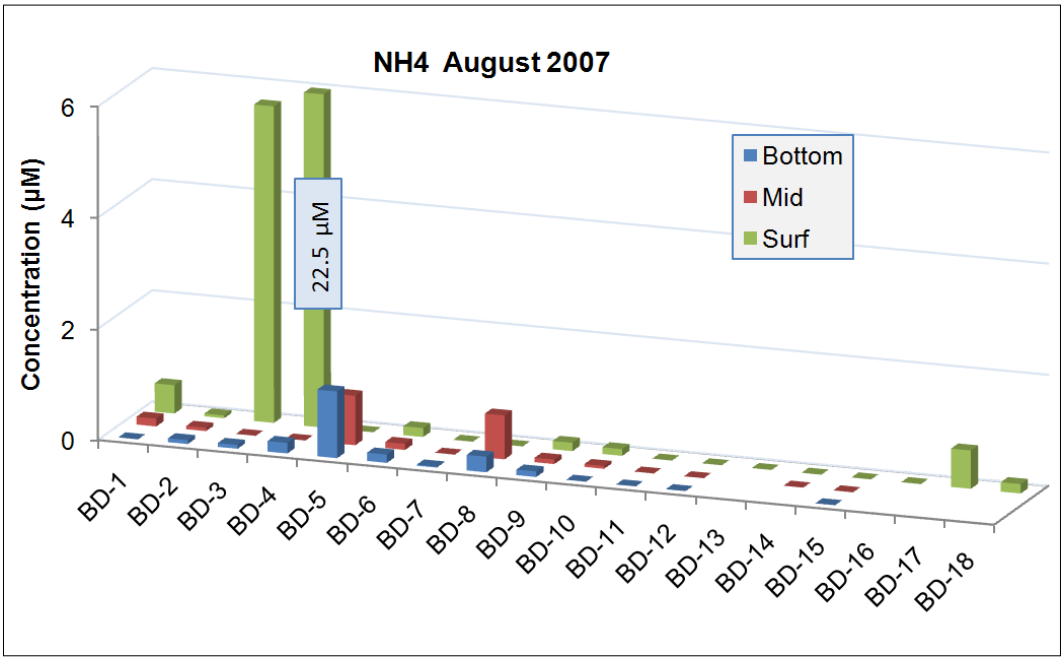

Figure 15: August 2007 NH4 concentrations for the Boynton-Delray water quality monitoring stations.

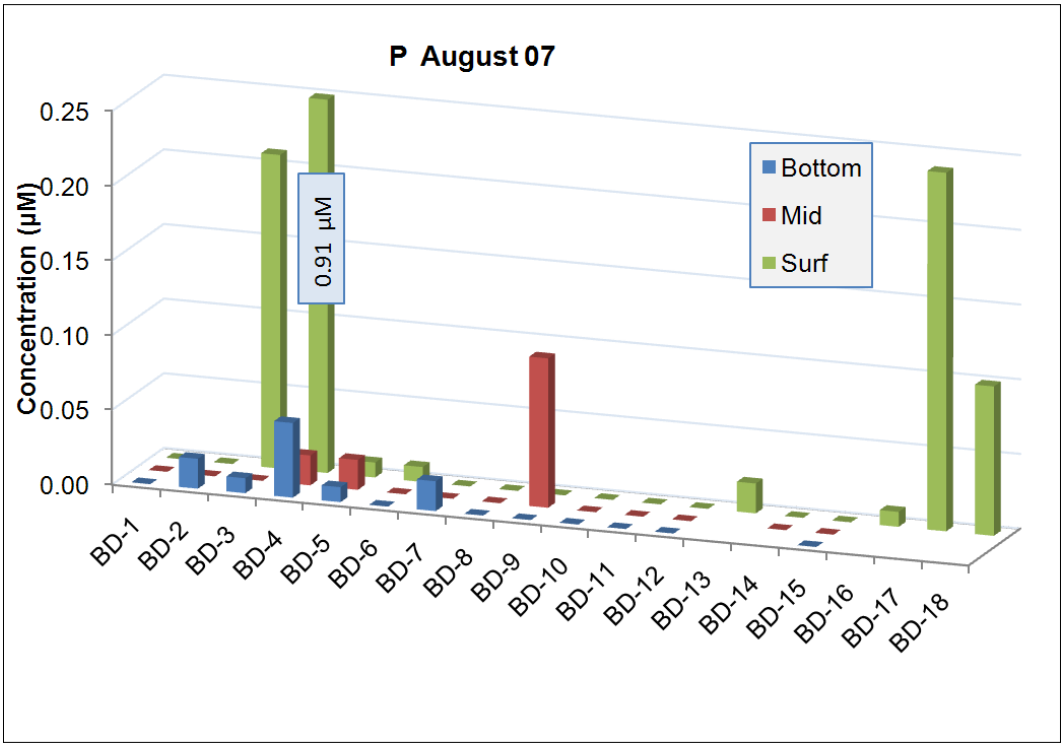

Figure 16: August 2007, P concentrations for the Boynton-Delray water quality monitoring stations.

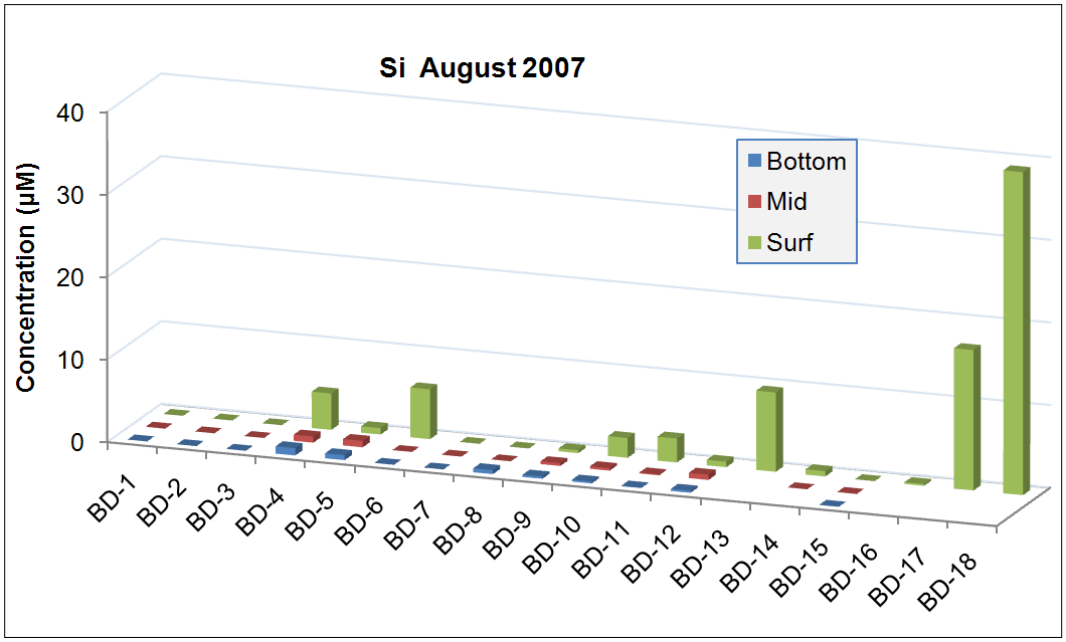

Figure 17: August 2007, Si concentrations for the Boynton-Delray water quality monitoring stations.

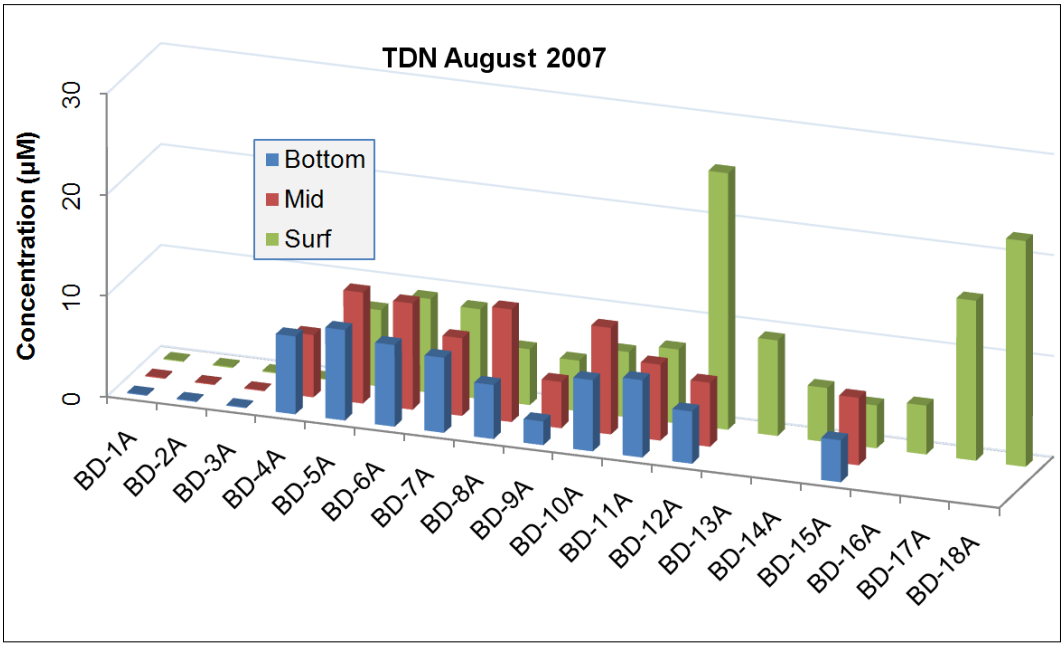

Figure 18: August 2007 total dissolved nitrogen values for the Boynton-Delray water quality monitoring stations.

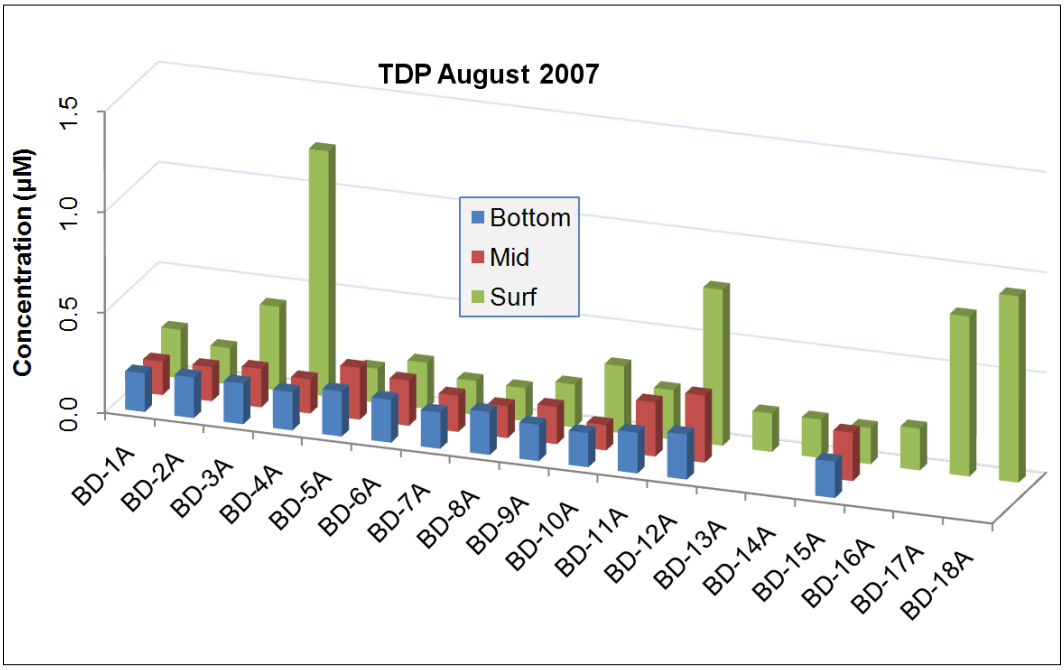

Figure 19: August 2007. TDP concentrations for the Boynton-Delray water quality monitoring stations.

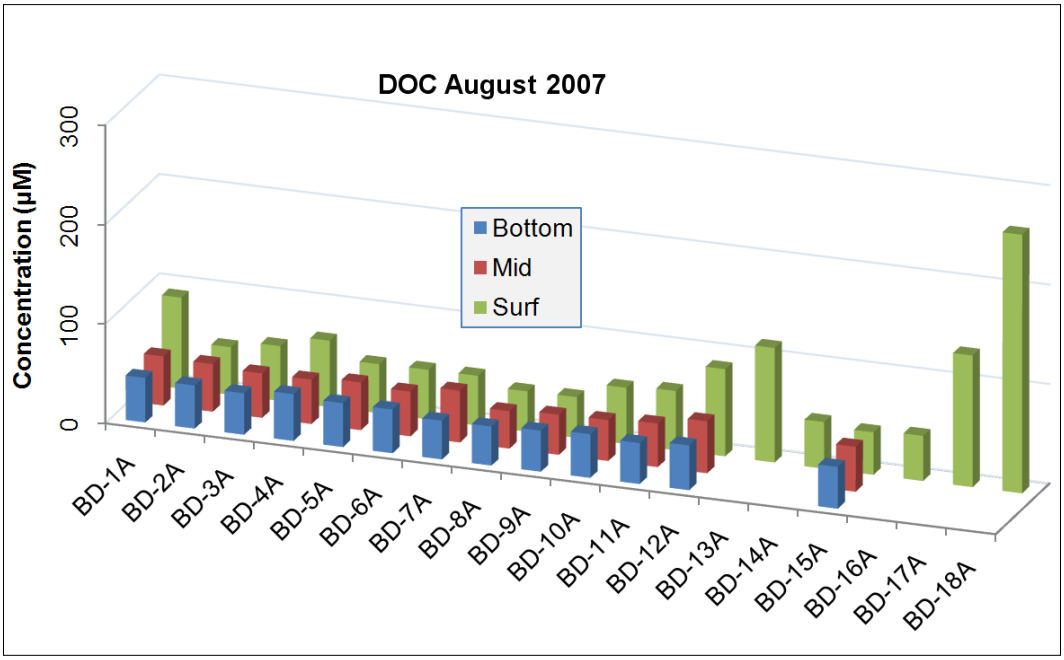

Figure 20: August 2007. DOP concentrations for the Boynton-Delray water quality monitoring stations.

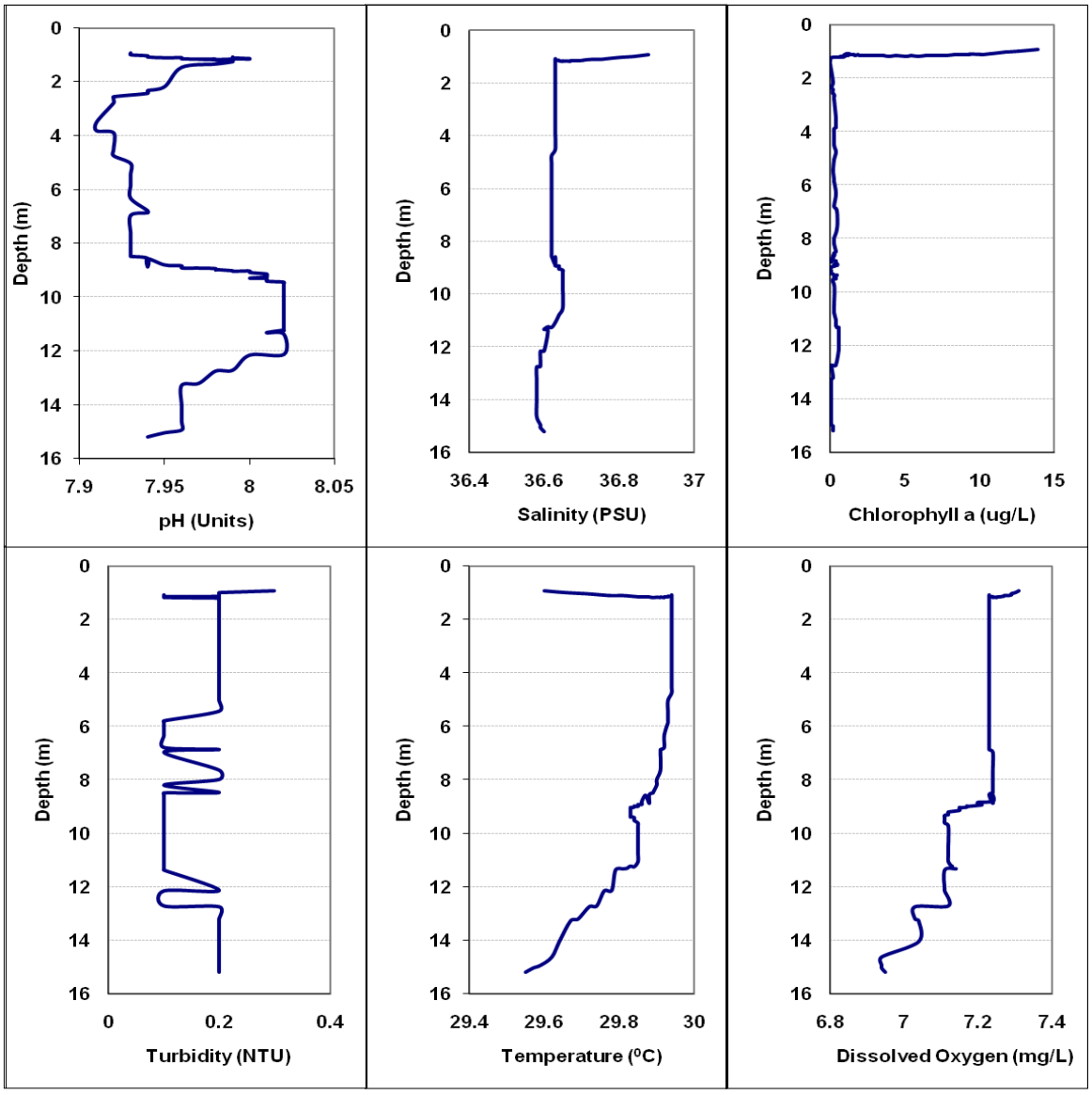

Figure 21: Boynton-Delray water quality monitoring YSI cast at station BD-2 August 2007.

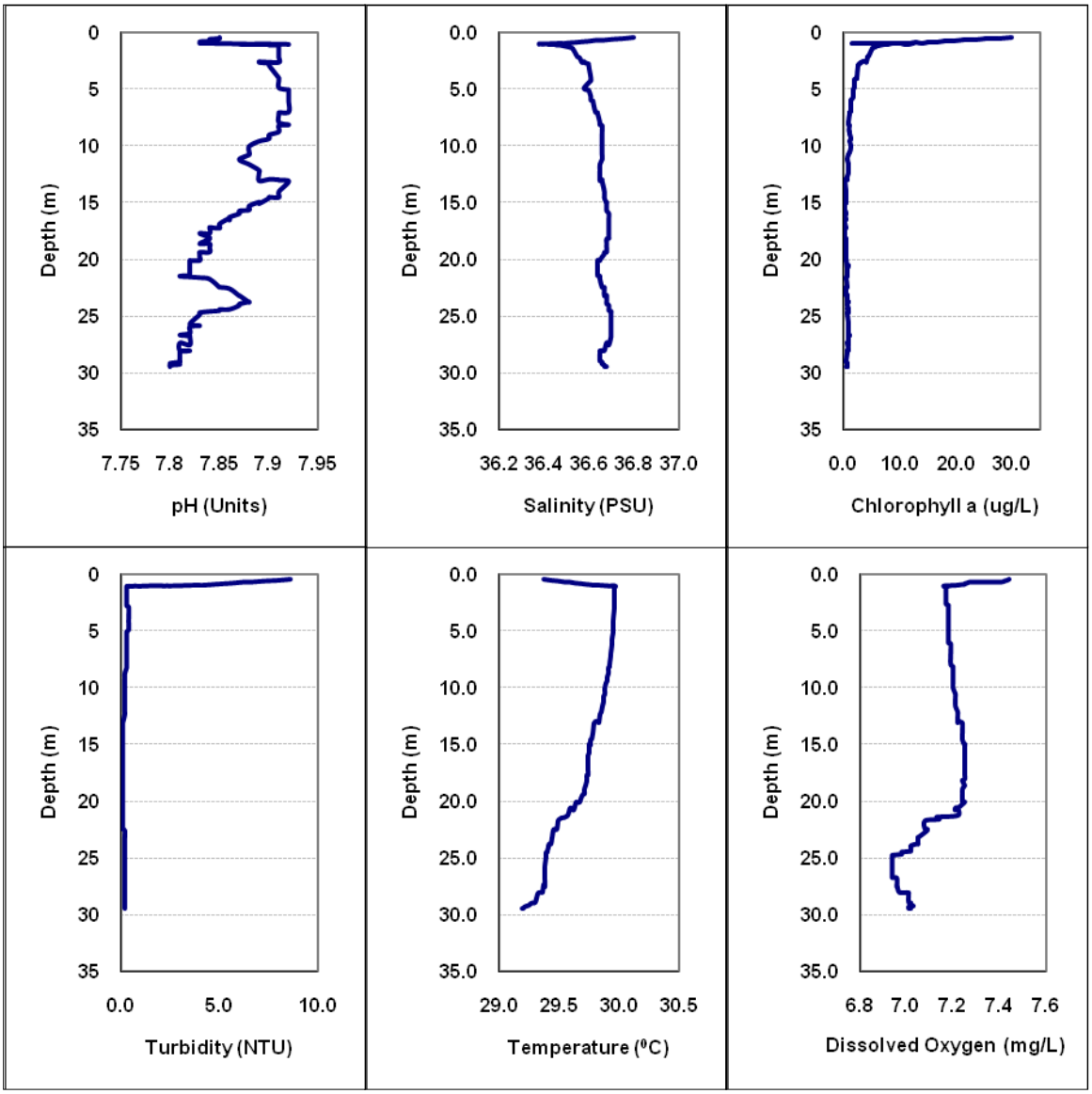

FIGURE 22: Boynton-Delray water quality monitoring YSI cast at station BD-3 August 2007.

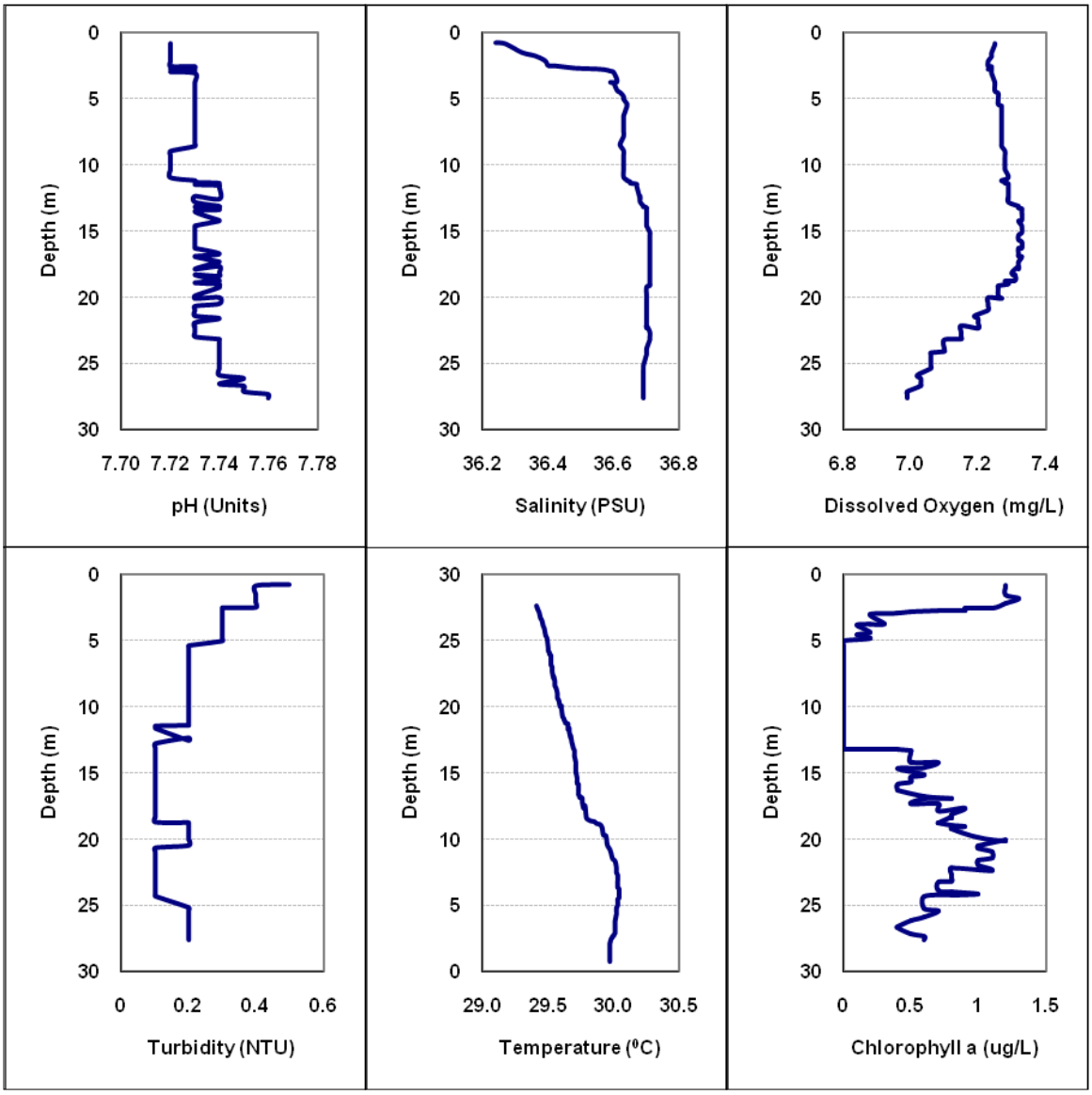

Figure 23: Boynton-Delray water quality monitoring YSI cast at station BD-4 August 2007.

9.3 OCTOBER 2007

Water quality monitoring was conducted on October 18 and 19, 2007, from the RV Cable. All stations were sampled for all water quality parameters listed in Table 2. All vertical profiles were conducted using the YSI 6600 sonde. Stations BD-14 and BD-15 were not sampled due to unfavorable marine conditions. The times and dates of sample collection are listed in Table 14. The water quality data is listed below in Tables 15-17. Vertical profiles of the water column for each station are in Figures 35-48.

The tides on October 18th were (01:38; 14:28) High and (08:32; 21:06) Low. On October 19th the tides were (02:28; 15:23) High and (09:26; 22:08) Low. Seas were 2 feet or less on October 18th with winds SE 5-10kts, while on the 19th seas were 4 feet with SSE winds 15-20kts. Palm Beach County received approximately 7 inches of rain the day before sampling. The flood gates were opened and freshwater was being released into LWL. A large presence of freshwater plants was observed floating in the LWL and exiting the Boynton Inlet to the coastal ocean on the outgoing tide. A water sample was also collected at a water release site (WR) and was analyzed for all the water quality parameters. A total of 4 duplicates were collected for each of the water quality parameters sampled. The Boynton Inlet station BD-13A was collected towards the end of an outgoing tidal cycle. The outfall boil was not visible at the surface so the samples were collected at the known coordinates of the South Central Outfall. The nutrient values were higher at station BD-5A just north of the outfall possibly indicating the presence of the boil at the surface. The current direction was northerly during sampling operations.

NO_3-N+NO_2-N values ranged from 0.02µM to 2.20µM over the reef and outfall stations with the highest value occurring just north of the boil (BD-5A)., while the Boynton Inlet and LWL values ranged from 1.40µM to 8.90µM. NH_4-N values ranged from BDL to 3.45µM with the highest value at station BD-5A just north of the boil, while the values varied from 0.64µM to 7.13µM for the Boynton Inlet and LWL. Ortho-PO_4-P values varied from BDL to 0.50µM over the reef and outfall with the highest value at BD-5A just north of the boil, while values ranged from 0.42µM to 2.40µM for Boynton Inlet and LWL. SiO_4-Si values ranged from BDL to 0.53µM over the reef and outfall, while values varied between BDL to 34.70µM for the Boynton Inlet and LWL. TDN values ranged from 3.96µM to 17.94µM for the reef and outfall stations, while Boynton Inlet and LWL varied between 9.59µM to 41.52µM. DOC values ranged from 36.36µM to 49.86µM for the reef and outfall stations, while the Boynton Inlet and LWL varied between 82.43µM to 465.29µM.

Salinity values ranged from 35.7 to 36.5 salinity units over the reef and outfall sampling stations, while the salinity varied from 3.3 to 33.2 salinity units for the LWL and Boynton Inlet sites. Temperature did not vary much ranging from 27.7°C to 28.6°C for all stations with the LWL having the lowest temperatures. pH values ranged from 8.08 to 8.14 units over the reef and outfall area, while the Boynton Inlet and LWL sites ranged from 7.48 to 8.11 units. Chlorophyll values ranged from 0.206µg/L to 0.906µg/L over the reef and outfall sites, while values ranged from 1.79µg/L to 25.91µg/L for the Boynton Inlet and LWL sampling sites. TSS values varied from 0.02mg/L to 0.52mg/L for the reef and

outfall sampling sites, while the Boynton Inlet and LWL sites varied from 1.63mg/L to 5.14mg/L.

Table 14: Date and Time of water sample collection for October 2007.

Date	Time (Local)	Station	Latitude	Longitude	Depth (m)
10/18/2007	8:10	BD-1A	26.42550	-80.04545	0
10/18/2007	8:10	BD-1B	26.42550	-80.04545	16
10/18/2007	8:10	BD-1C	26.42550	-80.04545	35
10/18/2007	8:56	BD-2A	26.44201	-80.04729	0
10/18/2007	8:56	BD-2B	26.44201	-80.04729	8
10/18/2007	8:56	BD-2C	26.44201	-80.04729	16
10/18/2007	9:21	BD-3A	26.45828	-80.04247	0
10/18/2007	9:21	BD-3B	26.45828	-80.04247	16
10/18/2007	9:21	BD-3C	26.45828	-80.04247	33
10/18/2007	9:40	BD-4A	26.46192	-80.04195	0
10/18/2007	9:40	BD-4B	26.46192	-80.04195	16
10/18/2007	9:40	BD-4C	26.46192	-80.04195	32
10/18/2007	10:00	BD-5A	26.46620	-80.04167	0
10/18/2007	10:00	BD-5B	26.46620	-80.04167	15
10/18/2007	10:00	BD-5C	26.46620	-80.04167	30
10/18/2007	10:38	BD-6A	26.47532	-80.03976	0
10/18/2007	10:38	BD-6B	26.47532	-80.03976	15
10/18/2007	10:38	BD-6C	26.47532	-80.03976	30
10/18/2007	11:05	BD-7A	26.48737	-80.03871	0
10/18/2007	11:05	BD-7B	26.48737	-80.03871	10
10/18/2007	11:05	BD-7C	26.48737	-80.03871	20
10/18/2007	11:41	BD-8A	26.51507	-80.03542	0
10/18/2007	11:41	BD-8B	26.51507	-80.03542	10
10/18/2007	11:41	BD-8C	26.51507	-80.03542	20
10/18/2007	12:11	BD-9A	26.50838	-80.04129	0
10/18/2007	12:11	BD-9B	26.50838	-80.04129	7
10/18/2007	12:11	BD-9C	26.50838	-80.04129	15
10/18/2007	12:36	BD-10A	26.52261	-80.03223	0
10/18/2007	12:36	BD-10B	26.52261	-80.03223	8
10/18/2007	12:36	BD-10C	26.52261	-80.03223	16
10/18/2007	13:06	BD-11A	26.53333	-80.03584	0
10/18/2007	13:06	BD-11B	26.53333	-80.03584	7
10/18/2007	13:06	BD-11C	26.53333	-80.03584	13
10/18/2007	13:30	BD-12A	26.53874	-80.03980	0
10/18/2007	13:30	BD-12B	26.53874	-80.03980	5
10/18/2007	13:30	BD-12C	26.53874	-80.03980	8
10/19/2007	9:00	BD-13A	26.54542	-80.04300	0
10/19/2007	N/A	BD-14A	26.54242	-80.03996	0
10/19/2007	N/A	BD-14C	26.54242	-80.03996	3
10/19/2007	N/A	BD-15A	26.55919	-80.03329	0
10/19/2007	N/A	BD-15B	26.55919	-80.03329	6
10/19/2007	N/A	BD-15C	26.55919	-80.03329	13
10/19/2007	9:15	BD-16A	26.54618	-80.04791	0
10/19/2007	9:30	BD-17A	26.54264	-80.04790	0
10/19/2007	9:45	BD-18A	26.53950	-80.04951	0
10/19/2007	10:00	WR	N/A	N/A	0

Table 15: October 2007 Boynton-Delray nutrient and DOC values in µM.

Station	Depth (m)	N+N (µM)	NH4 (µM)	P (µM)	Si (µM)	TDN (µM)	TDP (µM)	DOC (µM)
BD-1A	0	0.34	0.63	0.01	BDL	5.25	N/A	43.63
BD-1B	16	0.12	0.18	BDL	BDL	10.74	N/A	40.63
BD-1C	35	0.19	0.38	BDL	BDL	8.14	N/A	40.41
BD-2A	0	0.15	BDL	0.02	BDL	4.40	N/A	40.46
BD-2B	8	0.07	BDL	BDL	BDL	6.29	N/A	39.39
BD-2C	16	0.26	0.15	0.02	BDL	9.22	N/A	36.36
BD-3A	0	0.26	BDL	BDL	BDL	6.63	N/A	44.13
BD-3B	16	0.25	BDL	0.01	BDL	9.84	N/A	49.86
BD-3C	33	0.11	BDL	BDL	BDL	8.27	N/A	45.97
BD-4A	0	0.10	BDL	BDL	BDL	15.29	N/A	43.63
BD-4B	16	0.13	0.18	BDL	BDL	5.47	N/A	41.96
BD-4C	32	0.17	BDL	0.01	BDL	16.33	N/A	39.23
BD-5A	0	2.20	3.45	0.50	BDL	10.01	N/A	47.25
BD-5B	15	0.07	0.24	BDL	0.53	13.34	N/A	41.63
BD-5C	30	0.11	0.28	BDL	BDL	12.14	N/A	53.42
BD-6A	0	0.80	1.35	0.18	BDL	13.05	N/A	52.36
BD-6B	15	0.05	BDL	BDL	0.02	5.24	N/A	42.19
BD-6C	30	0.08	0.15	BDL	BDL	6.09	N/A	44.80
BD-7A	0	0.27	BDL	0.03	BDL	14.21	N/A	42.80
BD-7B	10	0.06	BDL	BDL	BDL	5.42	N/A	43.08
BD-7C	20	0.08	0.18	BDL	BDL	5.61	N/A	39.80
BD-8A	0	0.18	0.54	0.06	BDL	9.27	N/A	40.00
BD-8B	10	0.14	0.18	0.02	BDL	6.19	N/A	40.52
BD-8C	20	0.13	0.32	0.01	BDL	8.20	N/A	39.70
BD-9A	0	0.26	BDL	0.06	BDL	6.13	N/A	47.86
BD-9B	7	0.04	BDL	BDL	BDL	7.43	N/A	56.42
BD-9C	15	0.02	BDL	BDL	BDL	5.59	N/A	39.17
BD-10A	0	0.09	BDL	BDL	BDL	7.89	N/A	40.30
BD-10B	8	0.12	BDL	BDL	BDL	4.84	N/A	40.52
BD-10C	16	0.13	BDL	BDL	BDL	5.59	N/A	37.88
BD-11A	0	0.03	BDL	BDL	BDL	7.06	N/A	48.80
BD-11B	7	0.06	BDL	BDL	BDL	8.29	N/A	46.86
BD-11C	13	0.02	BDL	BDL	BDL	3.96	N/A	40.58
BD-12A	0	0.06	BDL	BDL	BDL	5.22	N/A	39.72
BD-12B	5	0.08	BDL	BDL	BDL	17.94	N/A	37.58
BD-12C	8	0.16	BDL	BDL	BDL	6.32	N/A	44.17
BD-13A	0	1.40	0.64	0.42	BDL	9.59	N/A	82.43
BD-14A	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BD-14C	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BD-15A	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BD-15B	6	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BD-15C	13	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BD-16A	0	7.30	6.20	1.90	29.60	37.93	N/A	308.43
BD-17A	0	8.90	7.13	1.80	30.30	39.73	N/A	324.55
BD-18A	0	7.50	7.05	2.40	27.10	40.81	N/A	295.48
WR	0	8.10	2.95	0.94	34.70	41.52	N/A	465.29

Table 16: October 2007 Boynton-Delray nutrient and DOC values in mg/L.

Station	Depth (m)	N+N (mg/L)	NH4 (mg/L)	P (mg/L)	Si (mg/L)	TDN (mg/L)	TDP (mg/L)	DOC (mg/L)
BD-1A	0	0.005	0.009	BDL	BDL	0.09	N/A	1.06
BD-1B	16	0.002	0.003	BDL	BDL	0.18	N/A	1.00
BD-1C	35	0.003	0.005	BDL	BDL	0.14	N/A	1.00
BD-2A	0	0.002	BDL	0.001	BDL	0.08	N/A	1.00
BD-2B	8	0.001	BDL	BDL	BDL	0.11	N/A	0.98
BD-2C	16	0.004	0.002	0.001	BDL	0.16	N/A	0.93
BD-3A	0	0.004	BDL	BDL	BDL	0.11	N/A	1.07
BD-3B	16	0.004	BDL	BDL	BDL	0.17	N/A	1.17
BD-3C	33	0.002	BDL	BDL	BDL	0.14	N/A	1.10
BD-4A	0	0.001	BDL	BDL	BDL	0.26	N/A	1.06
BD-4B	16	0.002	0.003	BDL	BDL	0.09	N/A	1.03
BD-4C	32	0.002	BDL	BDL	BDL	0.28	N/A	0.98
BD-5A	0	0.031	0.048	0.016	BDL	0.17	N/A	1.12
BD-5B	15	0.001	0.003	BDL	0.015	0.23	N/A	1.02
BD-5C	30	0.002	0.004	BDL	BDL	0.21	N/A	1.23
BD-6A	0	0.011	0.019	0.006	BDL	0.22	N/A	1.21
BD-6B	15	0.001	BDL	BDL	0.001	0.09	N/A	1.03
BD-6C	30	0.001	0.002	BDL	BDL	0.10	N/A	1.08
BD-7A	0	0.004	BDL	0.001	BDL	0.24	N/A	1.04
BD-7B	10	0.001	BDL	BDL	BDL	0.09	N/A	1.05
BD-7C	20	0.001	0.003	BDL	BDL	0.10	N/A	0.99
BD-8A	0	0.003	0.008	0.002	BDL	0.16	N/A	0.99
BD-8B	10	0.002	0.003	BDL	BDL	0.11	N/A	1.00
BD-8C	20	0.002	0.004	BDL	BDL	0.14	N/A	0.99
BD-9A	0	0.004	BDL	0.002	BDL	0.11	N/A	1.13
BD-9B	7	0.001	BDL	BDL	BDL	0.13	N/A	1.29
BD-9C	15	BDL	BDL	BDL	BDL	0.10	N/A	0.98
BD-10A	0	0.001	BDL	BDL	BDL	0.14	N/A	1.00
BD-10B	8	0.002	BDL	BDL	BDL	0.08	N/A	1.00
BD-10C	16	0.002	BDL	BDL	BDL	0.10	N/A	0.95
BD-11A	0	BDL	BDL	BDL	BDL	0.12	N/A	1.15
BD-11B	7	0.001	BDL	BDL	BDL	0.14	N/A	1.12
BD-11C	13	BDL	BDL	BDL	BDL	0.07	N/A	1.00
BD-12A	0	0.001	BDL	BDL	BDL	0.09	N/A	0.99
BD-12B	5	0.001	BDL	BDL	BDL	0.31	N/A	0.95
BD-12C	8	0.002	BDL	BDL	BDL	0.11	N/A	1.07
BD-13A	0	0.020	0.009	0.013	BDL	0.17	N/A	1.76
BD-14A	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BD-14C	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BD-15A	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BD-15B	6	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BD-15C	13	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BD-16A	0	0.102	0.087	0.059	0.829	0.65	N/A	5.82
BD-17A	0	0.125	0.100	0.056	0.848	0.68	N/A	6.11
BD-18A	0	0.105	0.099	0.074	0.759	0.70	N/A	5.59
WR	0	0.113	0.041	0.029	0.972	0.72	N/A	8.64

Table 17: October 2007 Boynton-Delray Salinity, pH, Chlorophyll and TSS results.

Station	Depth (m)	Temperature (^{0}C)	Salinity (Units)	pH (Units)	Chlorophyll a (μg/L)	Phaeopigments (μg/L)	TSS (mg/L)
BD-1A	0	28.3	36.2	8.10	0.585	0.136	0.21
BD-1B	16	28.4	36.3	8.13	0.327	0.118	0.17
BD-1C	35	28.5	36.4	8.11	0.206	0.110	0.16
BD-2A	0	28.3	36.2	8.09	0.556	0.156	0.15
BD-2B	8	28.5	36.3	8.12	0.555	0.133	0.19
BD-2C	16	28.5	36.4	8.13	0.344	0.103	0.15
BD-3A	0	28.3	36.2	8.13	0.666	0.100	0.19
BD-3B	16	28.5	36.5	8.11	0.297	0.134	0.11
BD-3C	33	28.5	36.5	8.12	0.288	0.091	0.05
BD-4A	0	28.4	35.9	8.11	0.772	0.210	0.16
BD-4B	16	28.5	36.4	8.13	0.676	0.154	0.15
BD-4C	32	28.5	36.5	8.14	0.291	0.097	0.12
BD-5A	0	28.4	36.1	8.12	0.639	0.125	0.24
BD-5B	15	28.5	36.5	8.14	0.308	0.101	0.04
BD-5C	30	28.5	36.5	8.14	0.287	0.124	0.12
BD-6A	0	28.4	36.2	8.09	0.796	0.165	0.21
BD-6B	15	28.5	36.5	8.13	0.288	0.106	0.15
BD-6C	30	28.5	36.5	8.12	0.314	0.097	0.14
BD-7A	0	28.6	36.2	8.12	0.906	0.130	0.31
BD-7B	10	28.5	36.4	8.11	0.351	0.096	0.44
BD-7C	20	28.5	36.5	8.13	0.362	0.110	0.15
BD-8A	0	N/A	35.8	8.10	0.497	0.146	0.24
BD-8B	10	N/A	35.7	8.11	0.535	0.107	0.18
BD-8C	20	N/A	35.9	8.11	0.488	0.094	0.16
BD-9A	0	28.6	36.4	8.08	0.517	0.083	0.27
BD-9B	7	28.5	36.4	8.10	0.610	0.089	0.20
BD-9C	15	28.5	36.4	8.11	0.633	0.123	0.34
BD-10A	0	28.5	36.4	8.10	0.540	0.080	0.32
BD-10B	8	28.5	36.4	8.10	0.520	0.081	0.16
BD-10C	16	28.5	36.4	8.11	0.500	0.077	0.17
BD-11A	0	28.6	36.4	8.11	0.568	0.082	0.16
BD-11B	7	28.5	36.4	8.12	0.563	0.073	0.02
BD-11C	13	28.5	36.5	8.12	0.563	0.088	0.15
BD-12A	0	28.5	36.3	8.12	0.466	0.045	0.30
BD-12B	5	28.5	36.4	8.13	0.529	0.080	0.52
BD-12C	8	28.5	36.4	8.11	0.522	0.087	0.43
BD-13A	0	28.2	33.2	8.11	1.789	0.925	1.83
BD-14A	0	N/A	N/A	N/A	N/A	N/A	N/A
BD-14C	3	N/A	N/A	N/A	N/A	N/A	N/A
BD-15A	0	N/A	N/A	N/A	N/A	N/A	N/A
BD-15B	6	N/A	N/A	N/A	N/A	N/A	N/A
BD-15C	13	N/A	N/A	N/A	N/A	N/A	N/A
BD-16A	0	27.9	19.8	7.75	6.627	2.966	1.63
BD-17A	0	28.7	17.7	7.69	6.089	3.181	2.08
BD-18A	0	27.7	13.2	7.70	5.876	2.564	1.56
WR	0	28.5	3.3	7.48	25.912	8.407	5.14

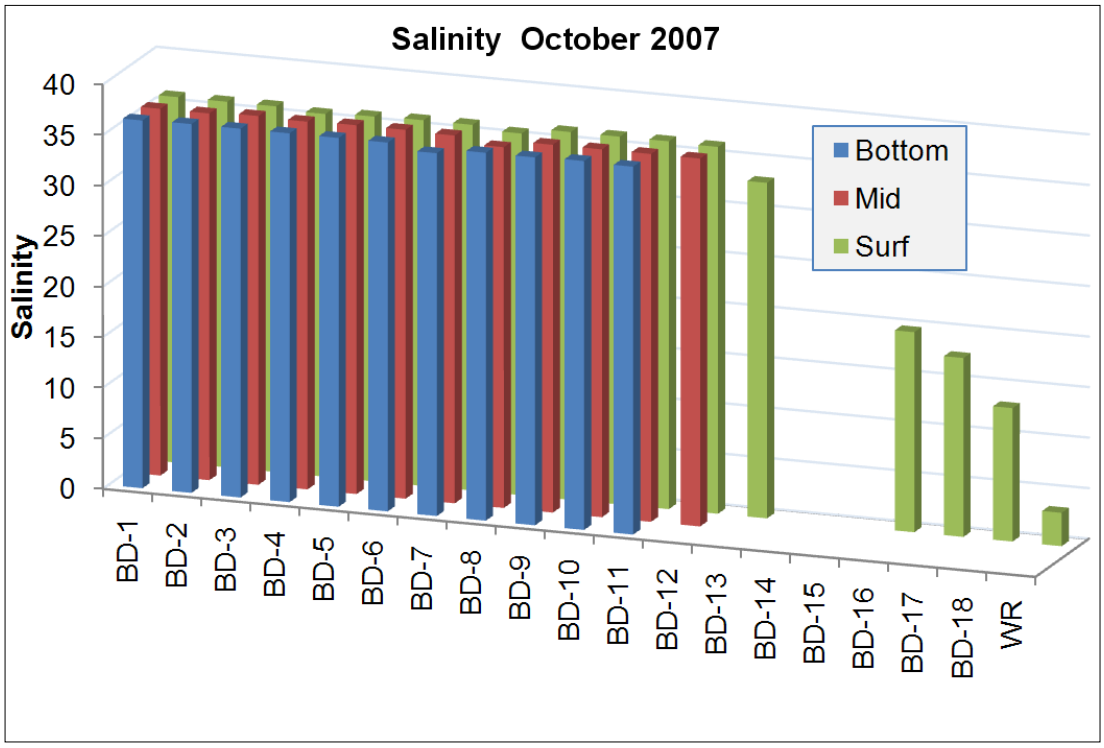

Figure 24: October 2007 salinity results for the Boynton-Delray water quality monitoring stations.

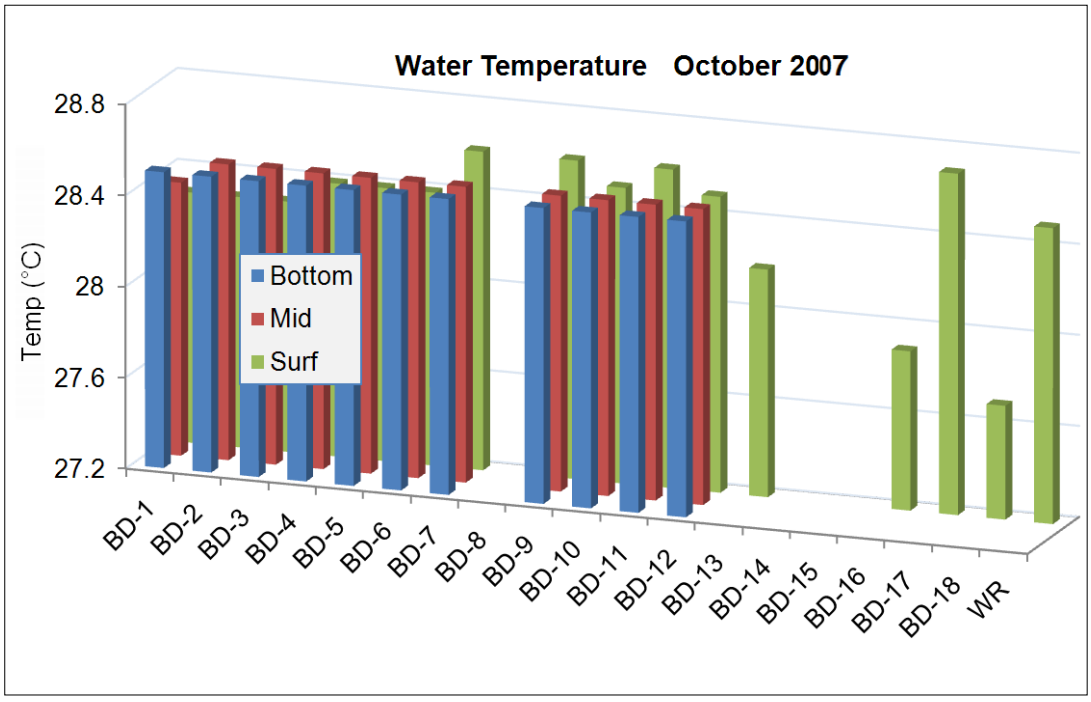

Figure 25: October 2007 temperature measurements for the Boynton-Delray water quality monitoring stations.

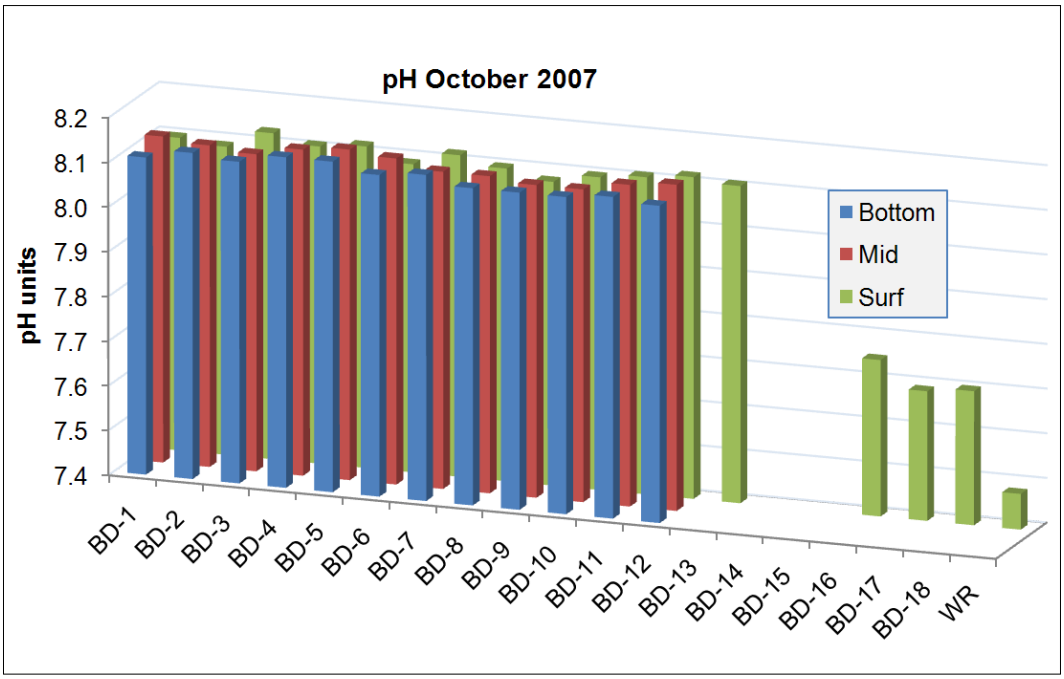

Figure 26: October 2007 pH measurements for the Boynton-Delray water quality monitoring stations.

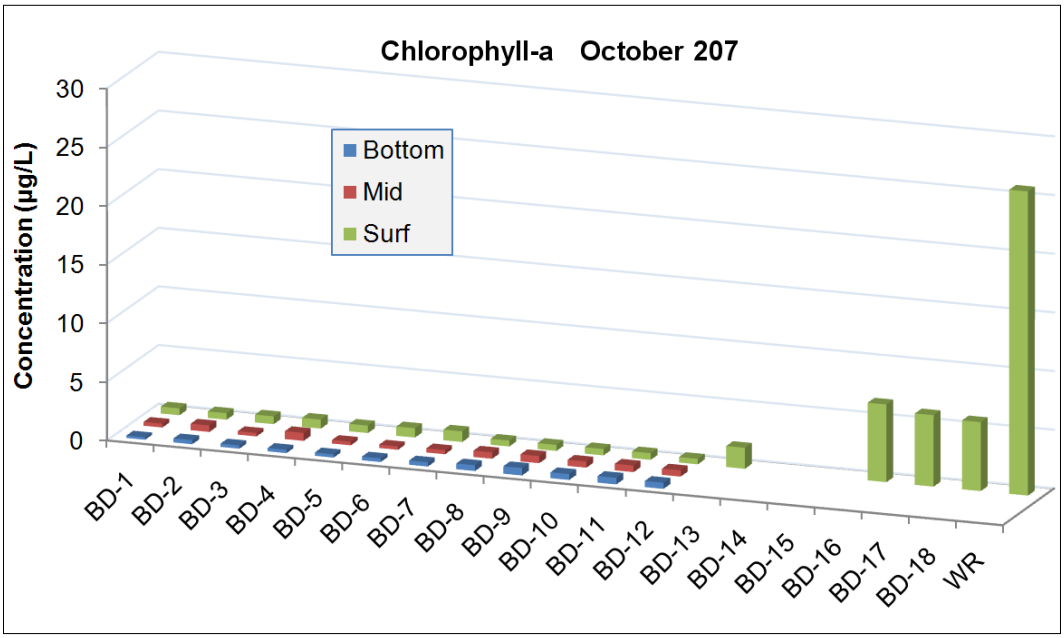

Figure 27: October 2007 chlorophyll concentrations for the Boynton-Delray water quality monitoring stations.

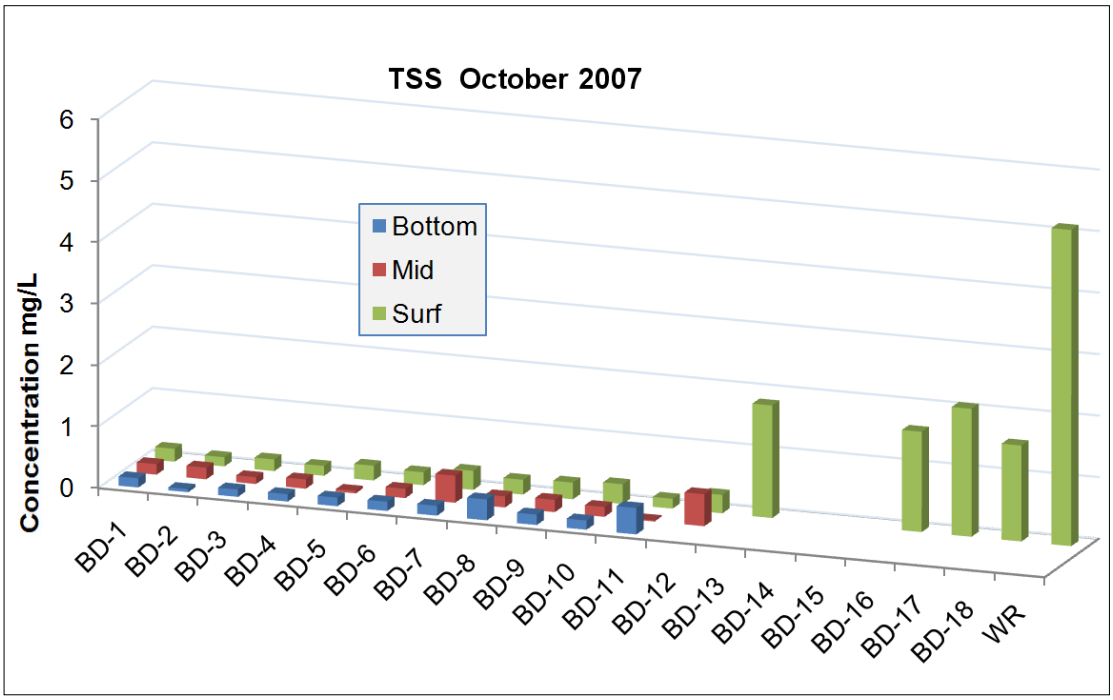

Figure 28: October 2007 TSS concentrations for the Boynton-Delray water quality monitoring stations.

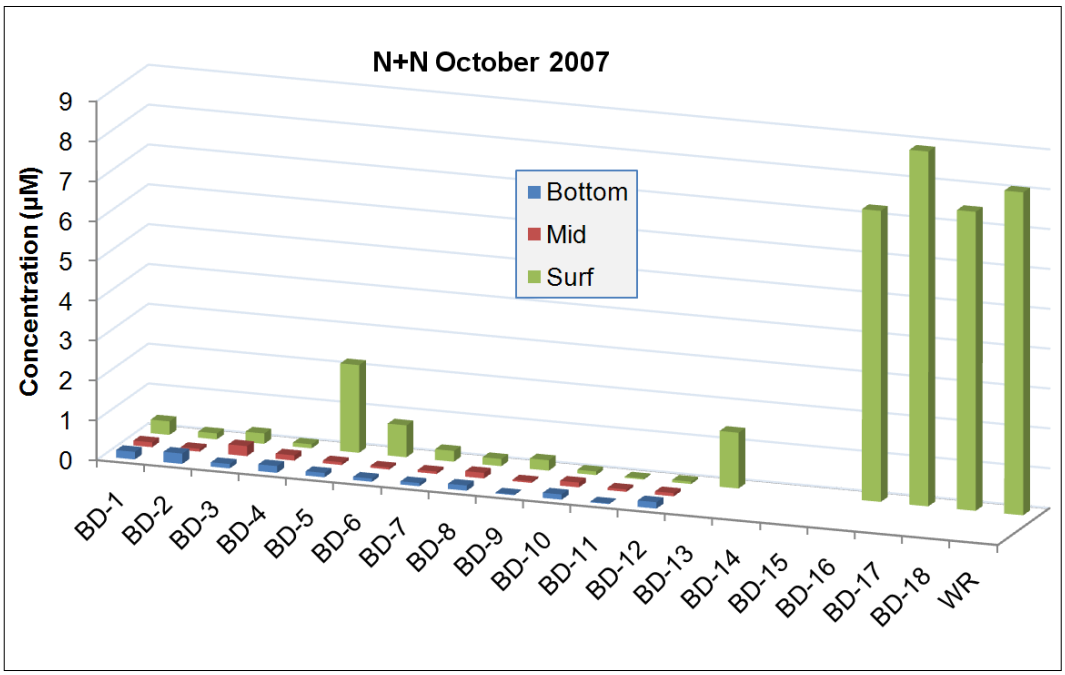

Figure 29: October 2007 N+N concentrations for the Boynton-Delray water quality monitoring stations.

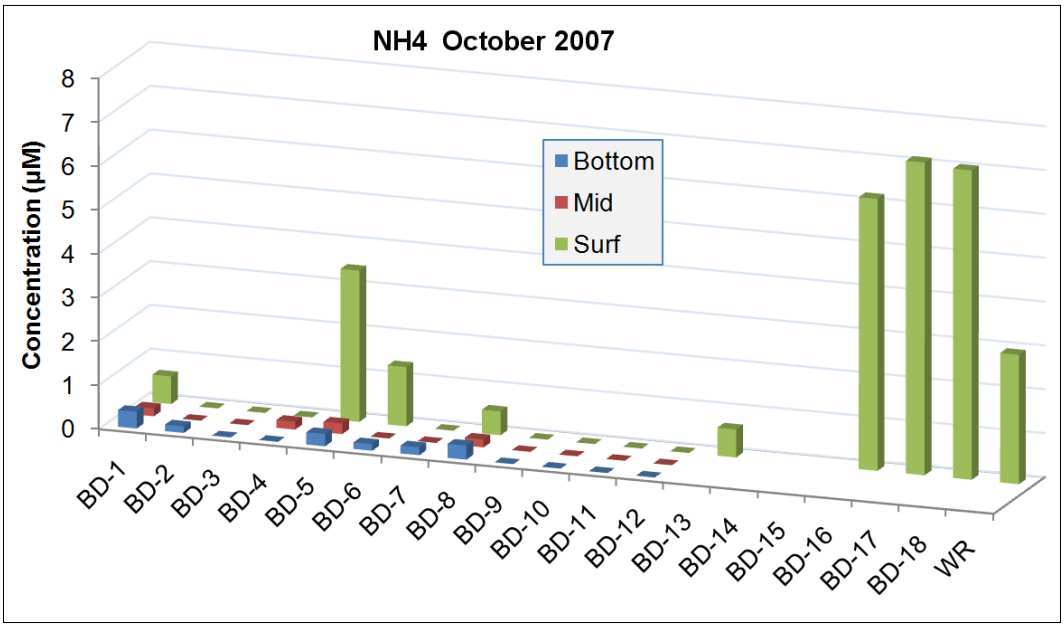

Figure 30: October 2007 NH4 concentrations for the Boynton-Delray water quality monitoring stations.

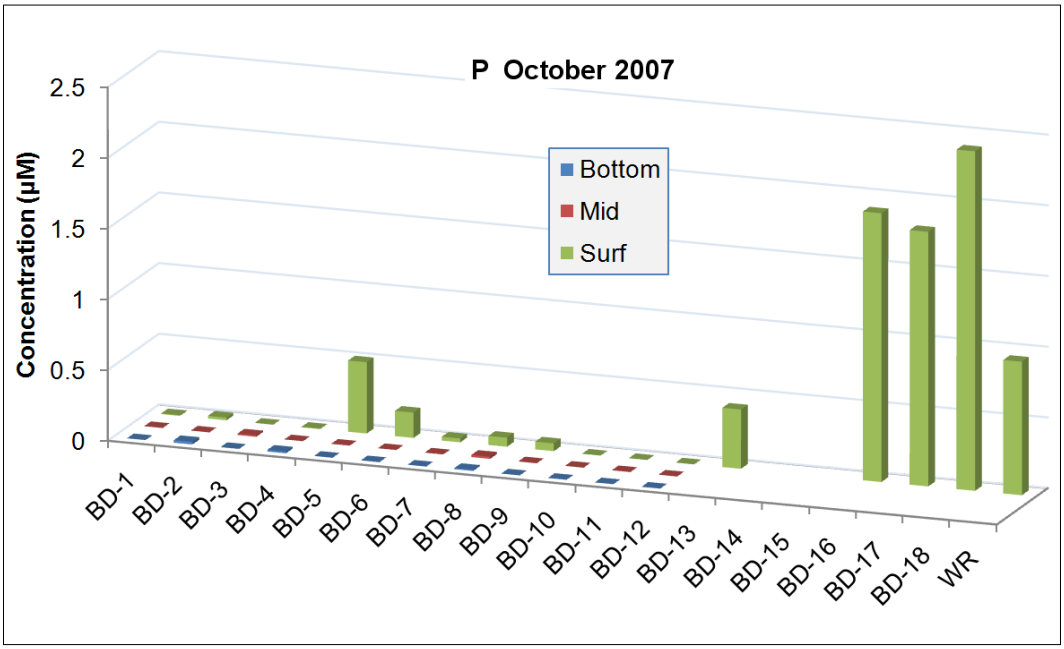

Figure 31: October 2007 P concentrations for the Boynton-Delray water quality monitoring stations.

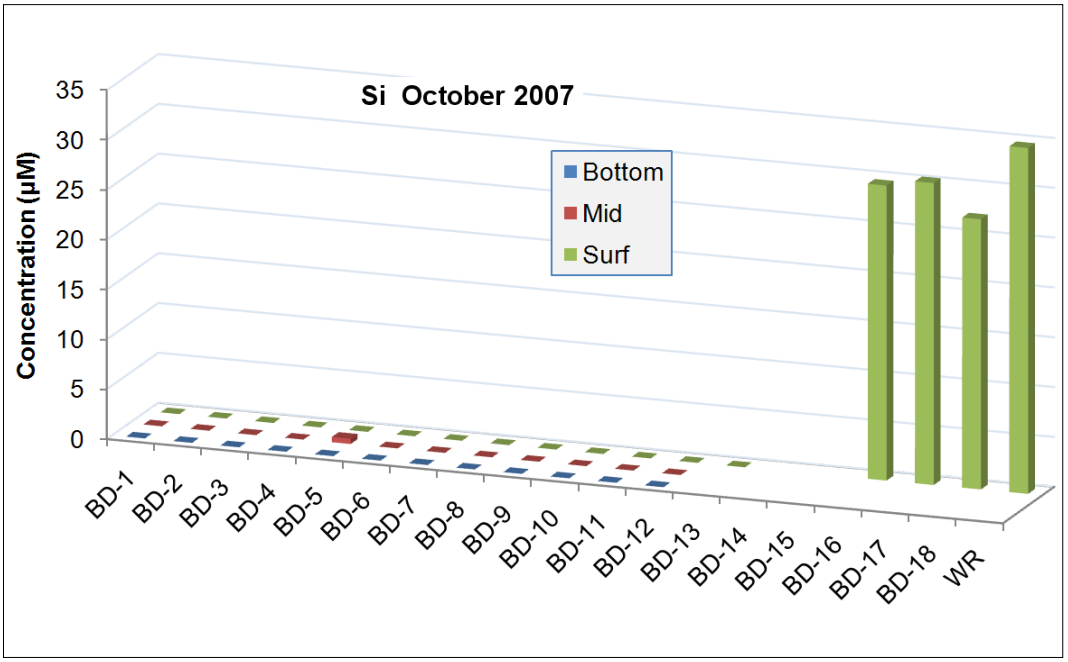

Figure 32: October 2007 Si concentrations for the Boynton-Delray water quality monitoring stations.

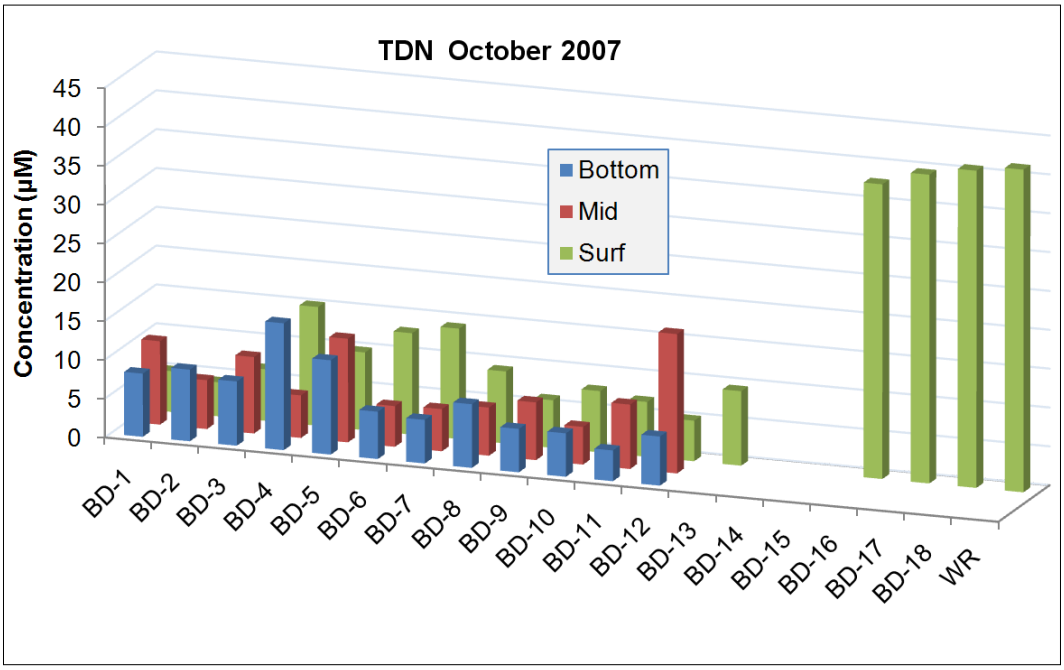

Figure 33: October 2007 TDN concentrations for the Boynton-Delray water quality monitoring stations.

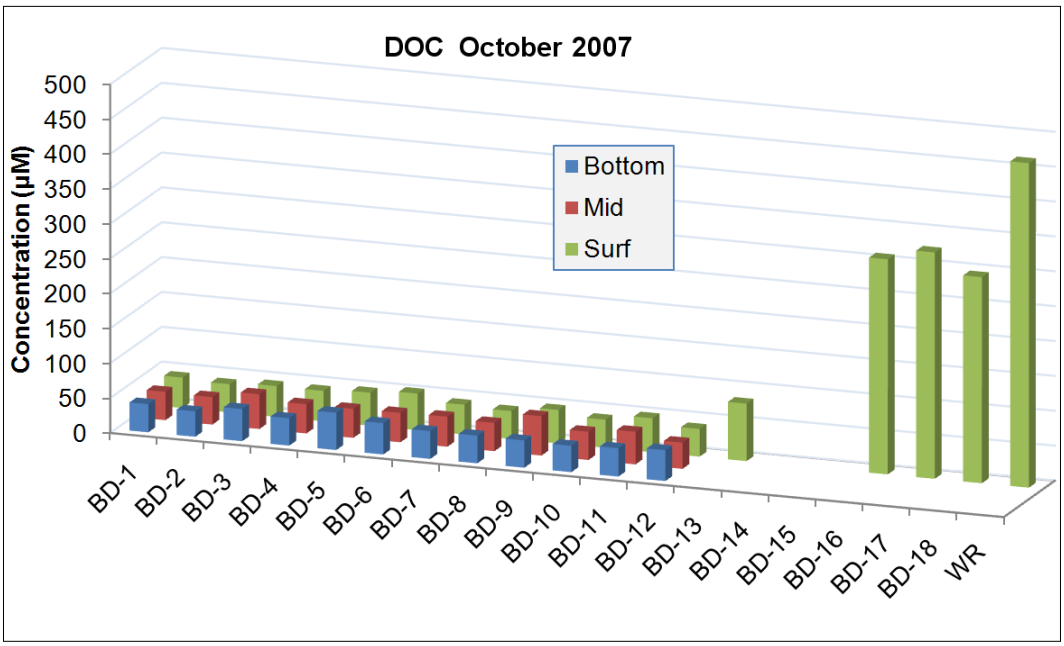

Figure 34: October 2007 DOC concentrations for the Boynton-Delray water quality monitoring stations.

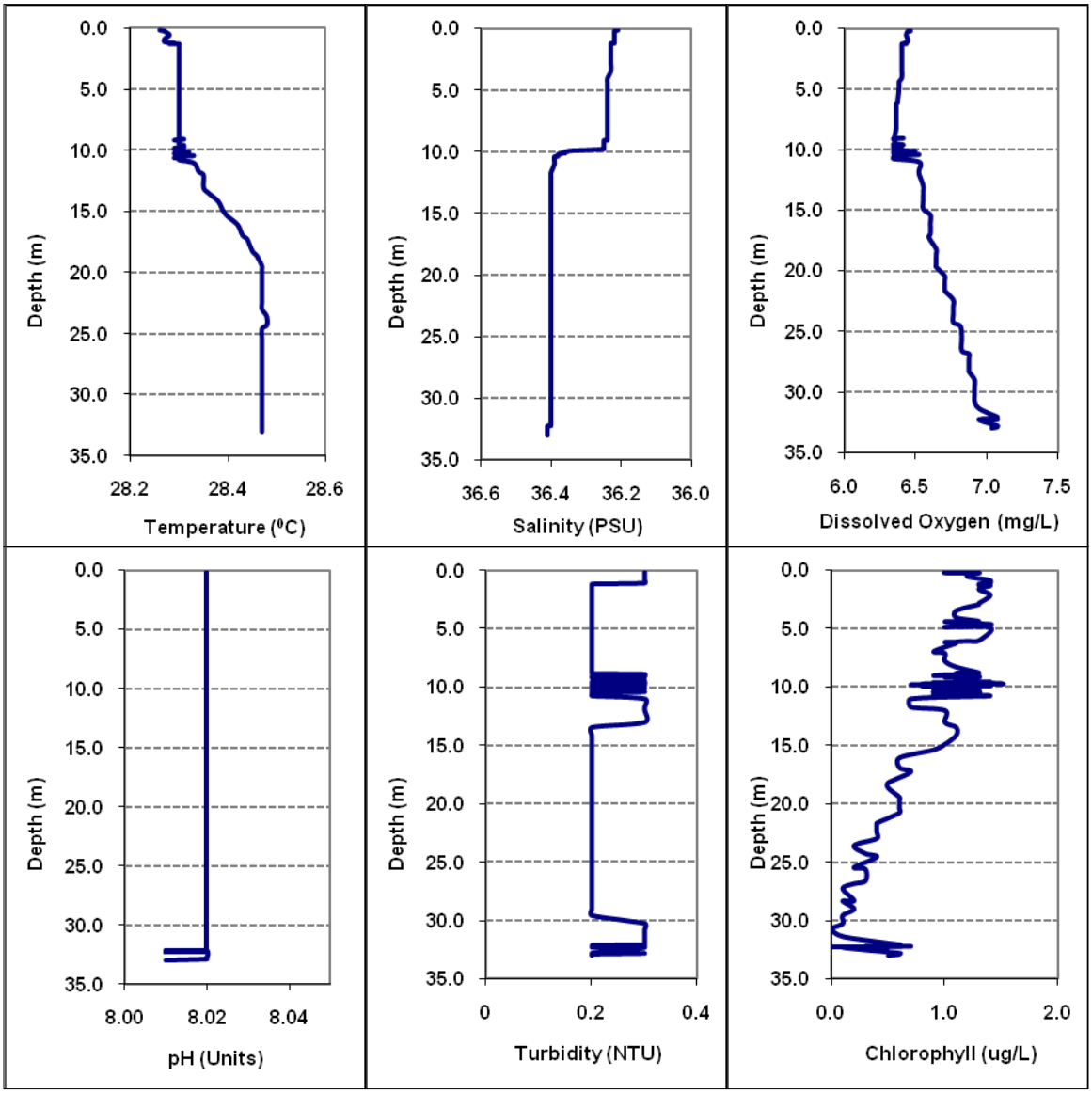

Figure 35: Boynton-Delray water quality monitoring YSI cast at station BD-1. October 2007.

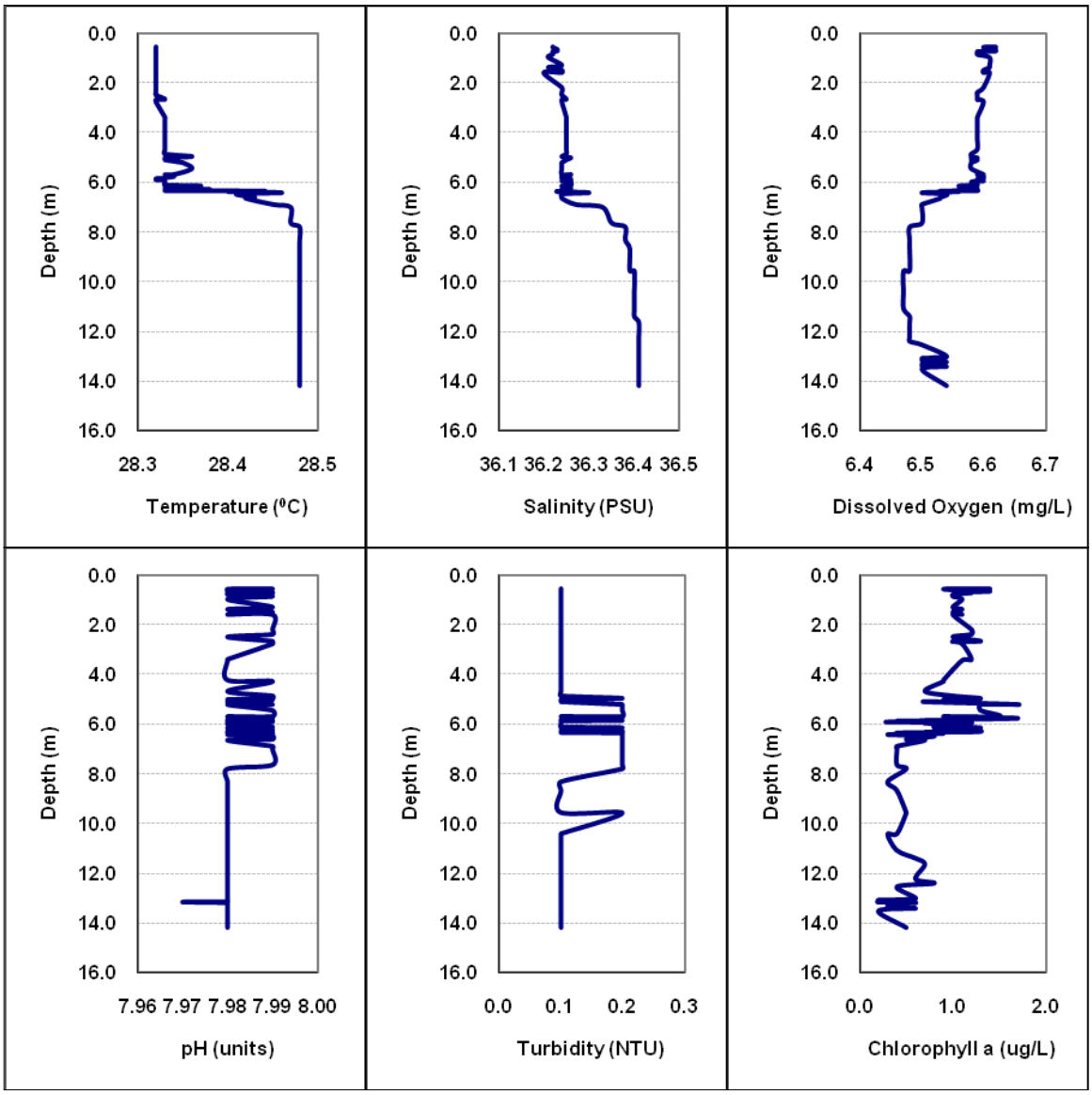

Figure 36: Boynton-Delray water quality monitoring YSI cast at station BD-2 October 2007.

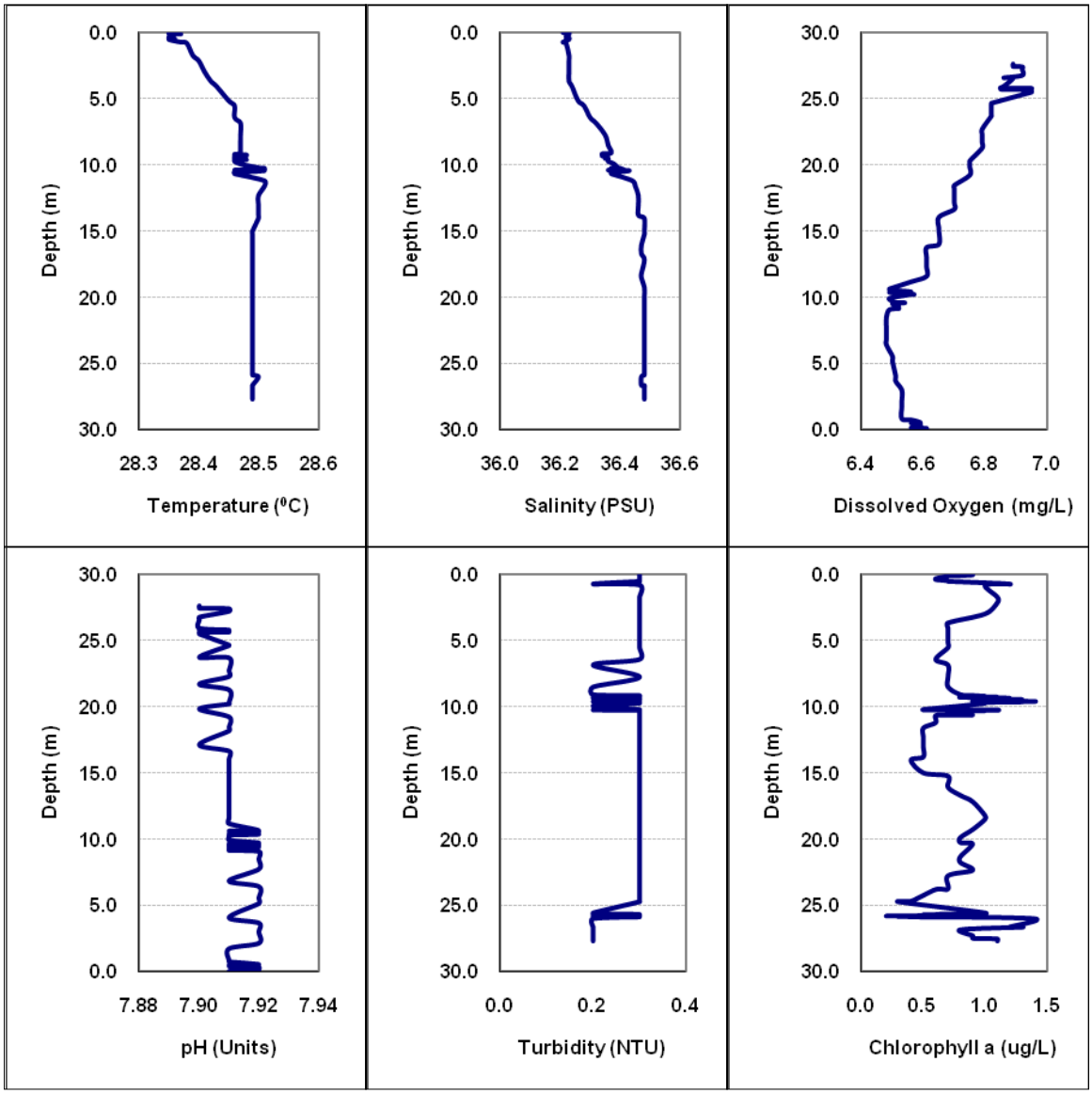

Figure 37: Boynton-Delray water quality monitoring YSI cast at station BD-3 October 2007.

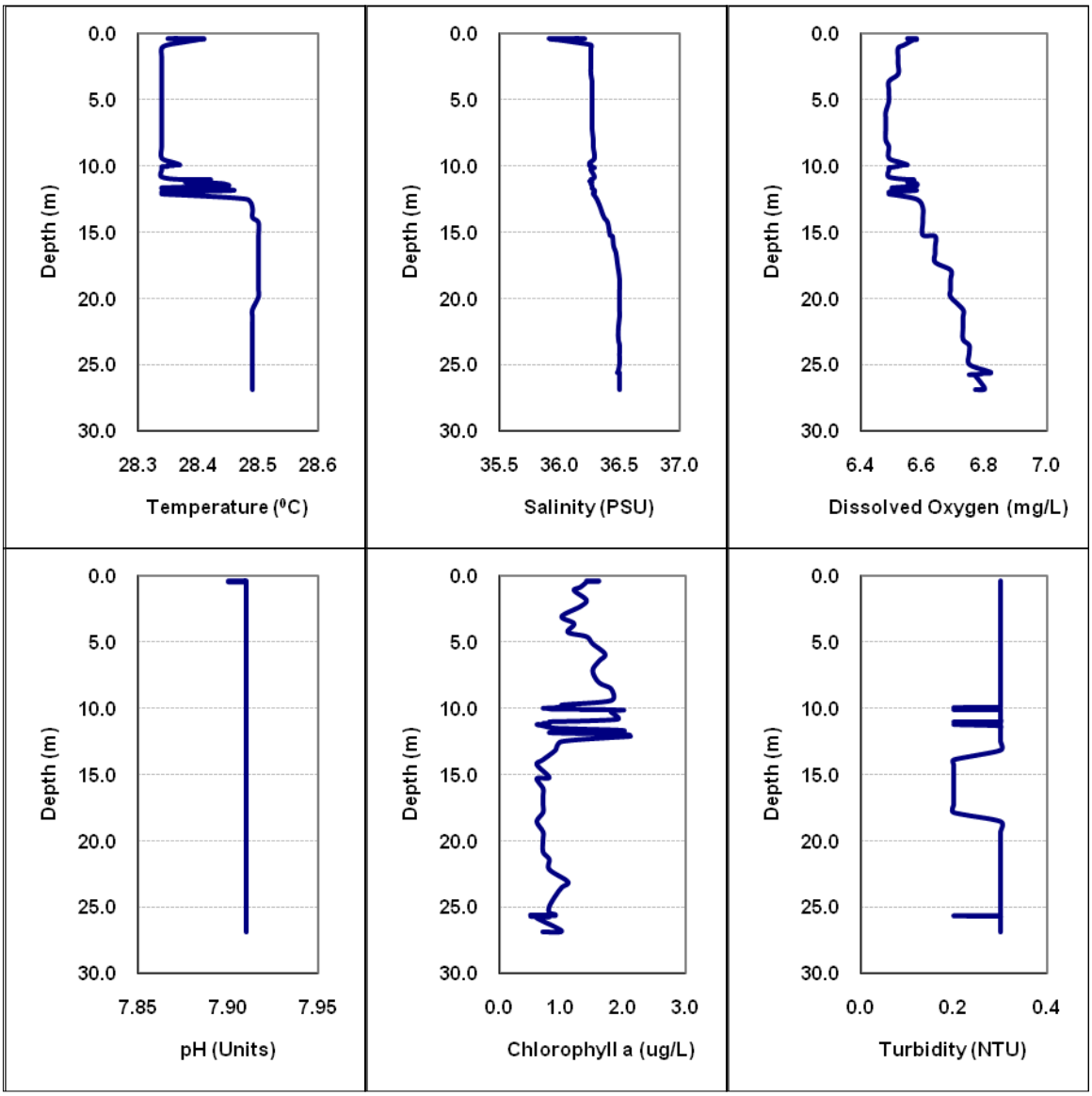

Figure 38: Boynton-Delray water quality monitoring YSI cast at station BD-4 October 2007.

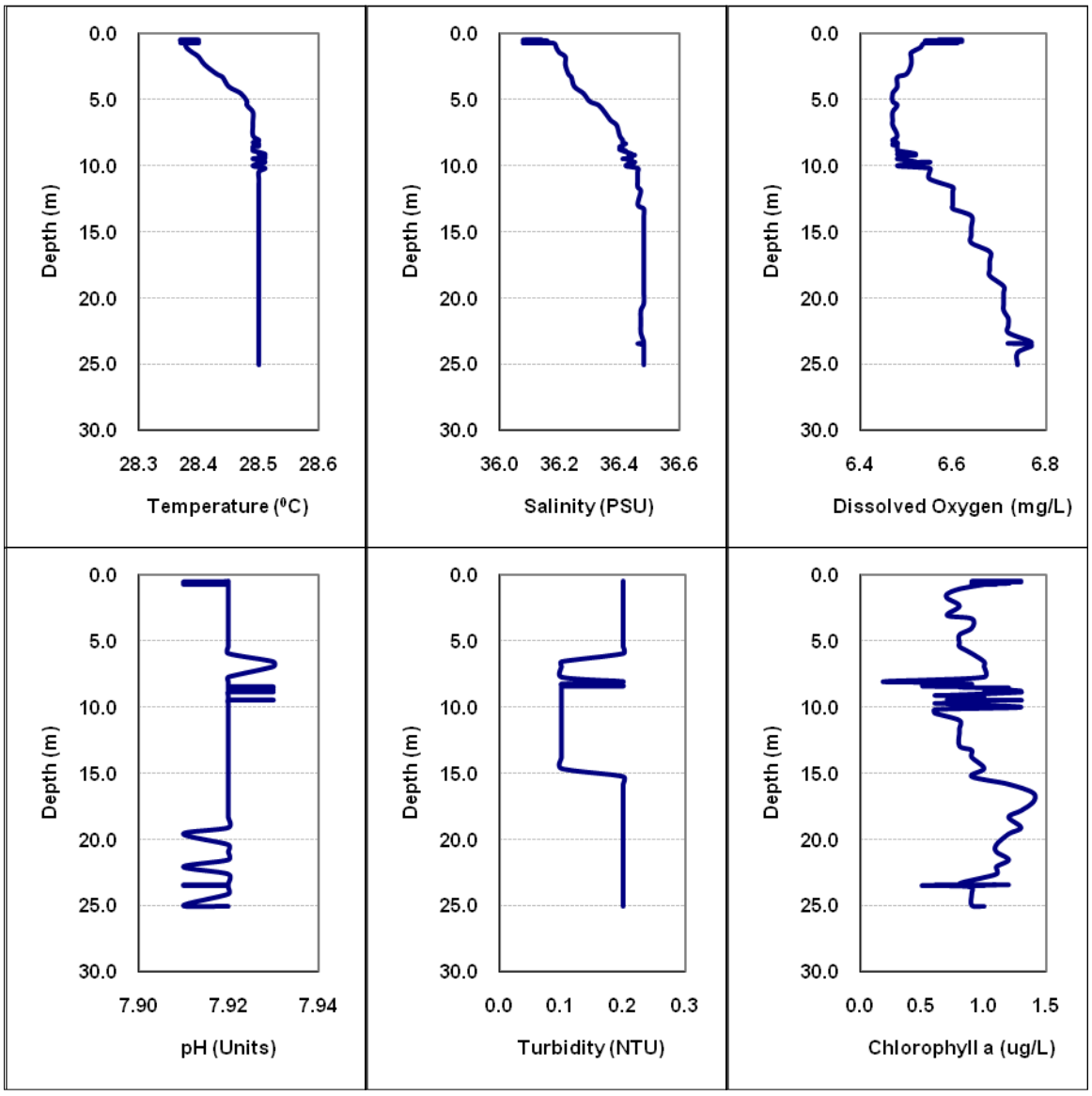

Figure 39: Boynton-Delray water quality monitoring YSI cast at station BD-5 October 2007.

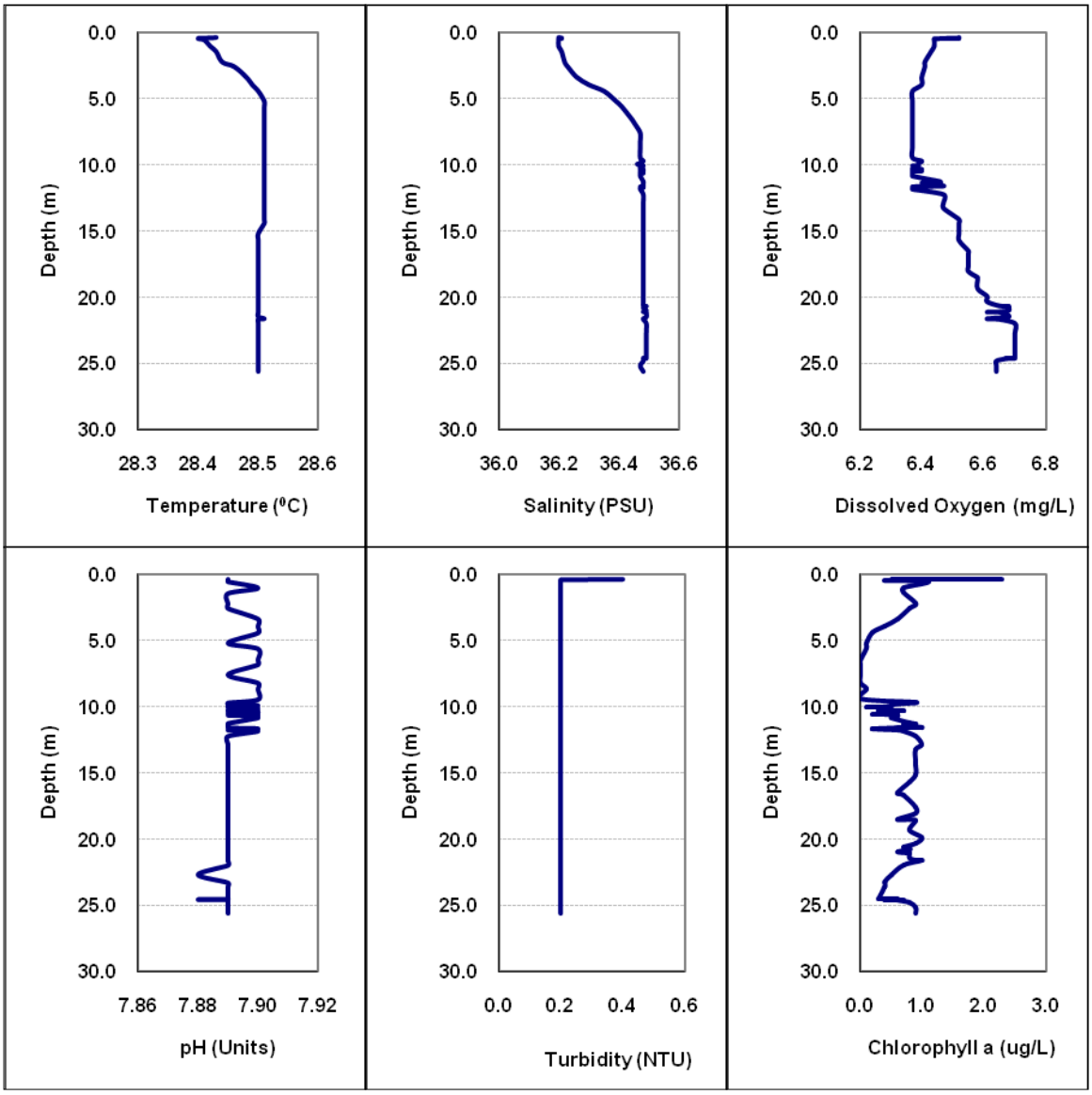

Figure 40: Boynton-Delray water quality monitoring YSI cast at station BD-6 October 2007.

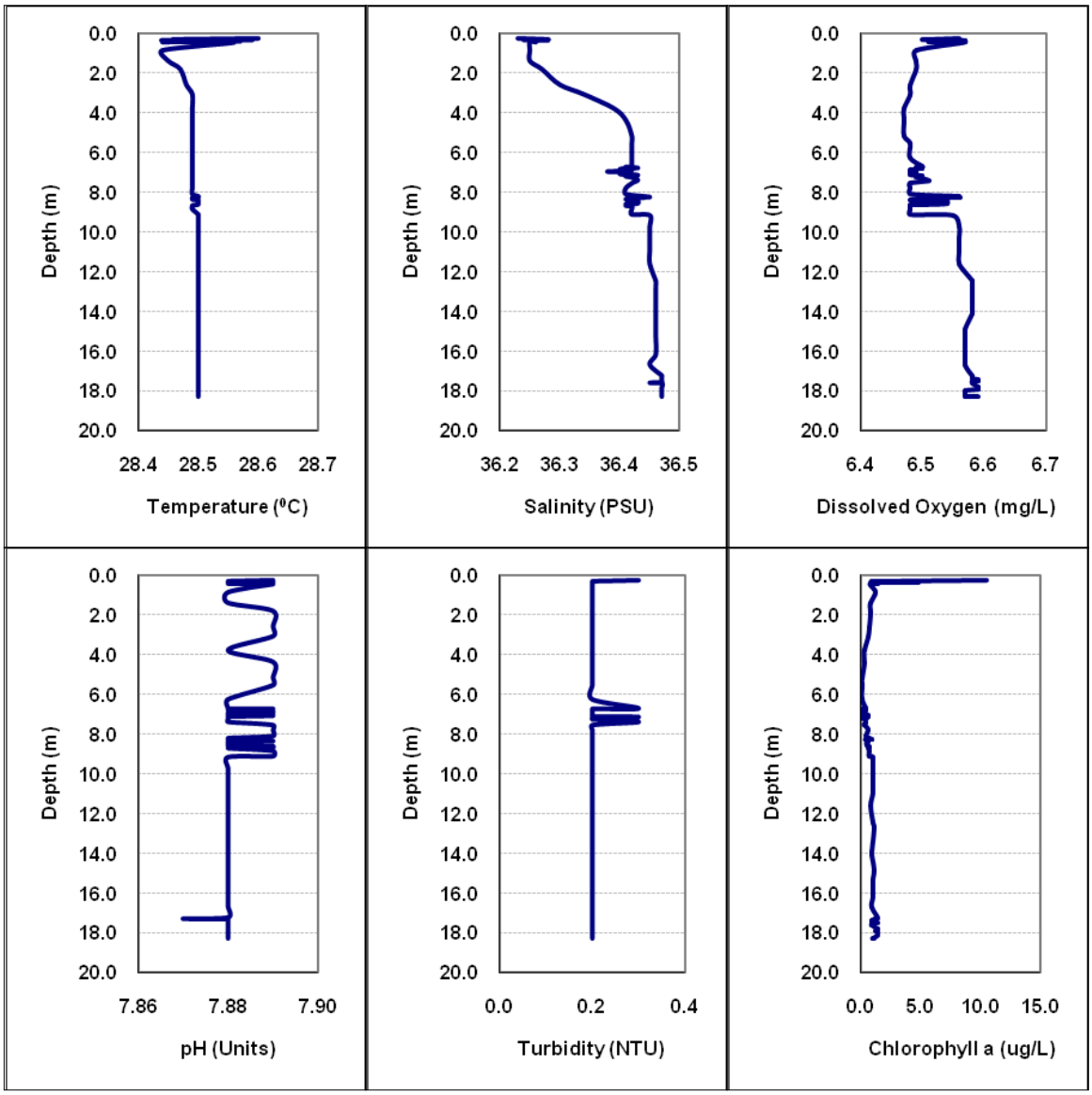

Figure 41: Boynton-Delray water quality monitoring YSI cast at station BD-7 October 2007.

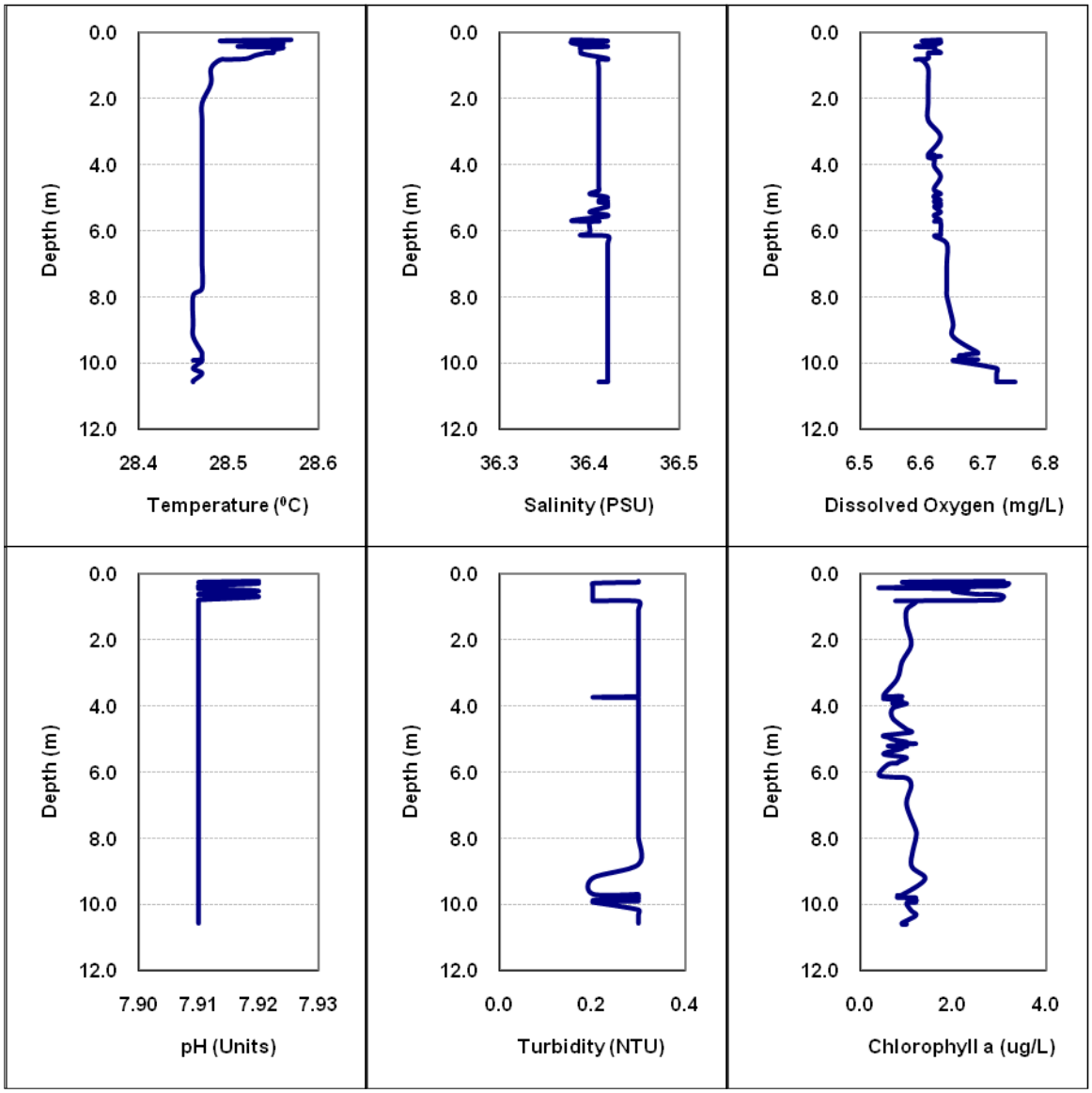

Figure 42: Boynton-Delray water quality monitoring YSI cast at station BD-9 October 2007.

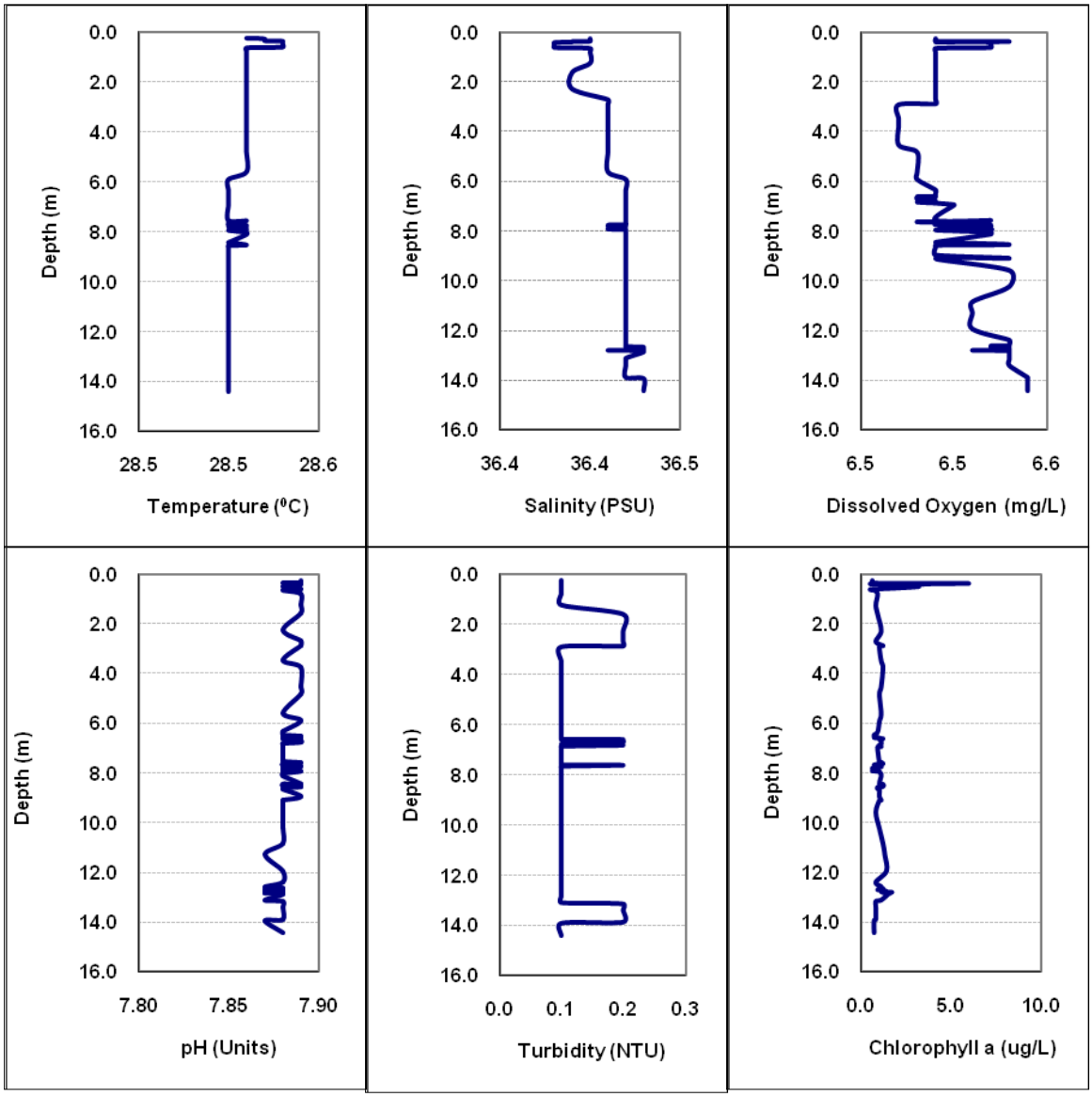

Figure 43: Boynton-Delray water quality monitoring YSI cast at station BD-10 October 2007.

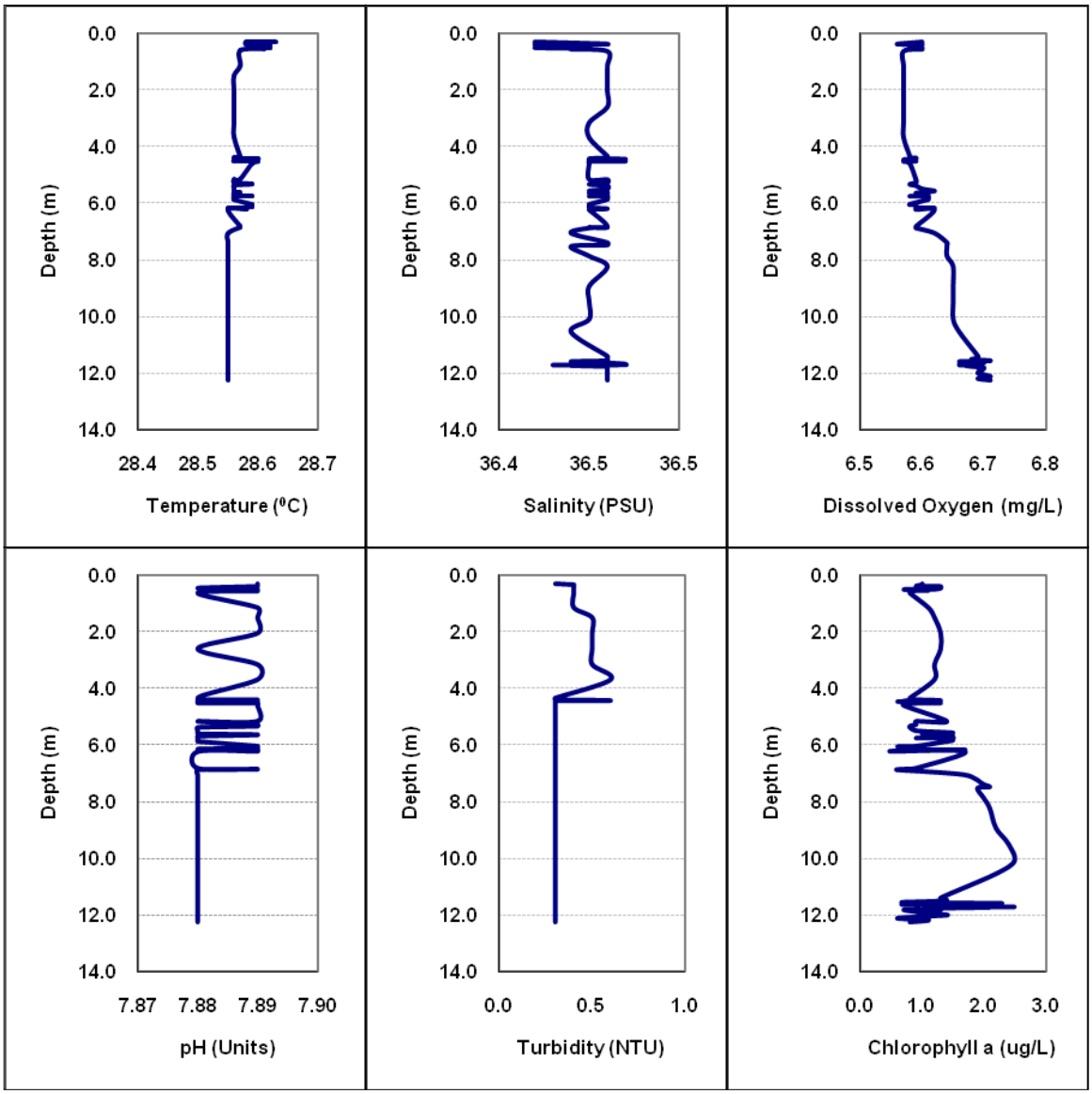

Figure 44: Boynton-Delray water quality monitoring YSI cast at station BD-11 October 2007.

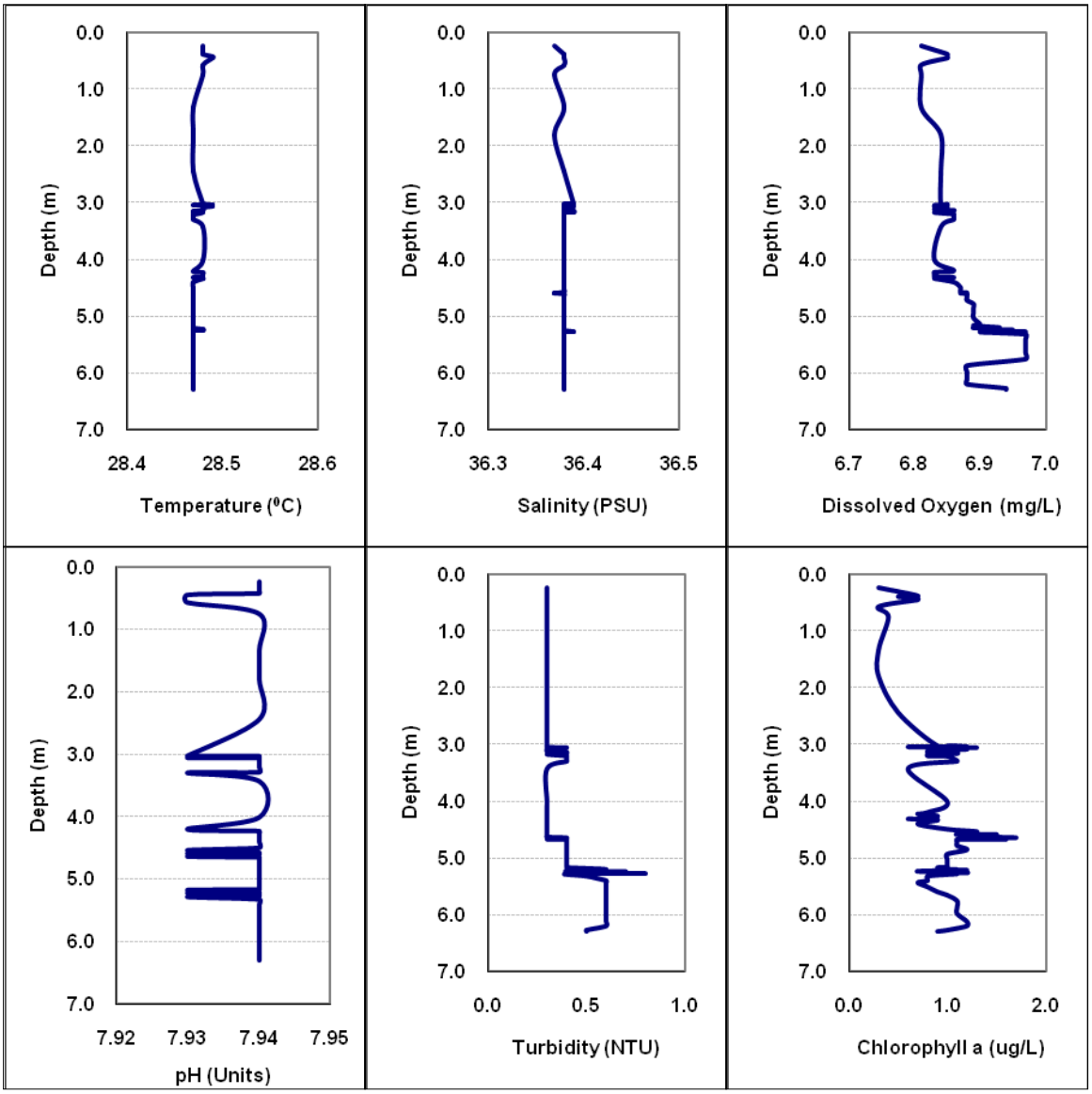

Figure 45: Boynton-Delray water quality monitoring YSI cast at station BD-12 October 2007.

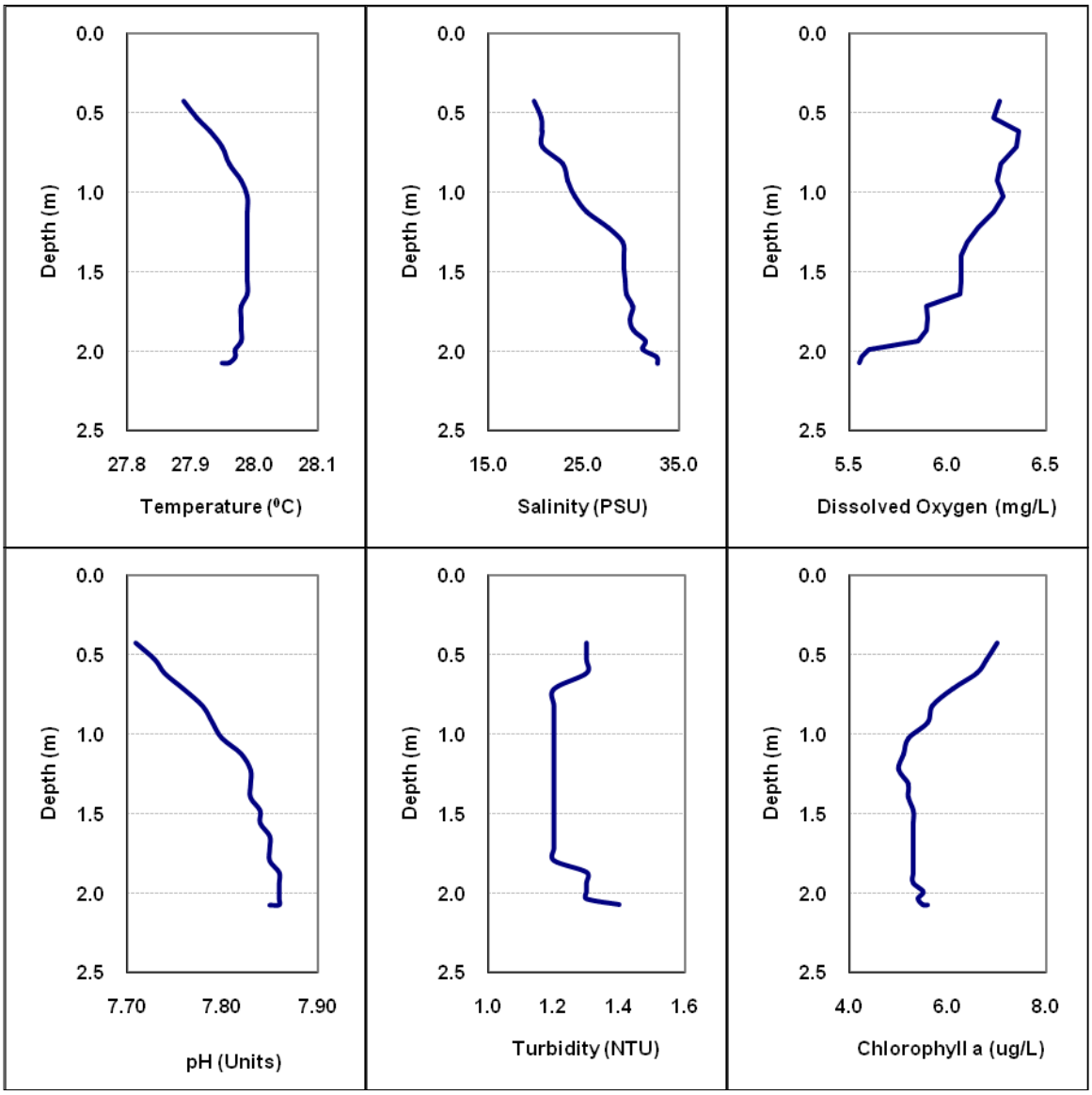

Figure 46: Boynton-Delray water quality monitoring YSI cast at station BD-16 October 2007.

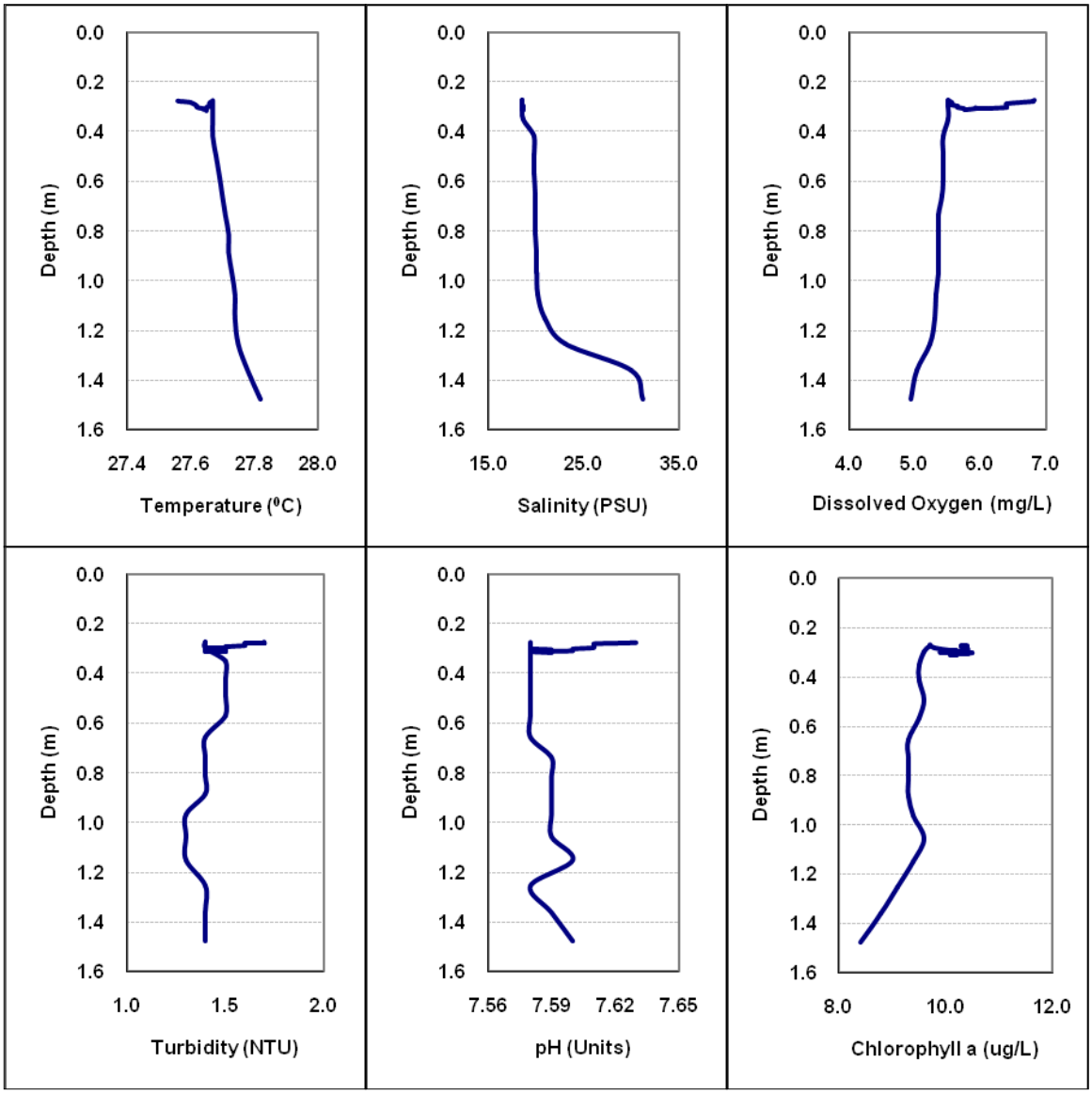

Figure 47: Boynton-Delray water quality monitoring YSI cast at station BD-17 October 2007.

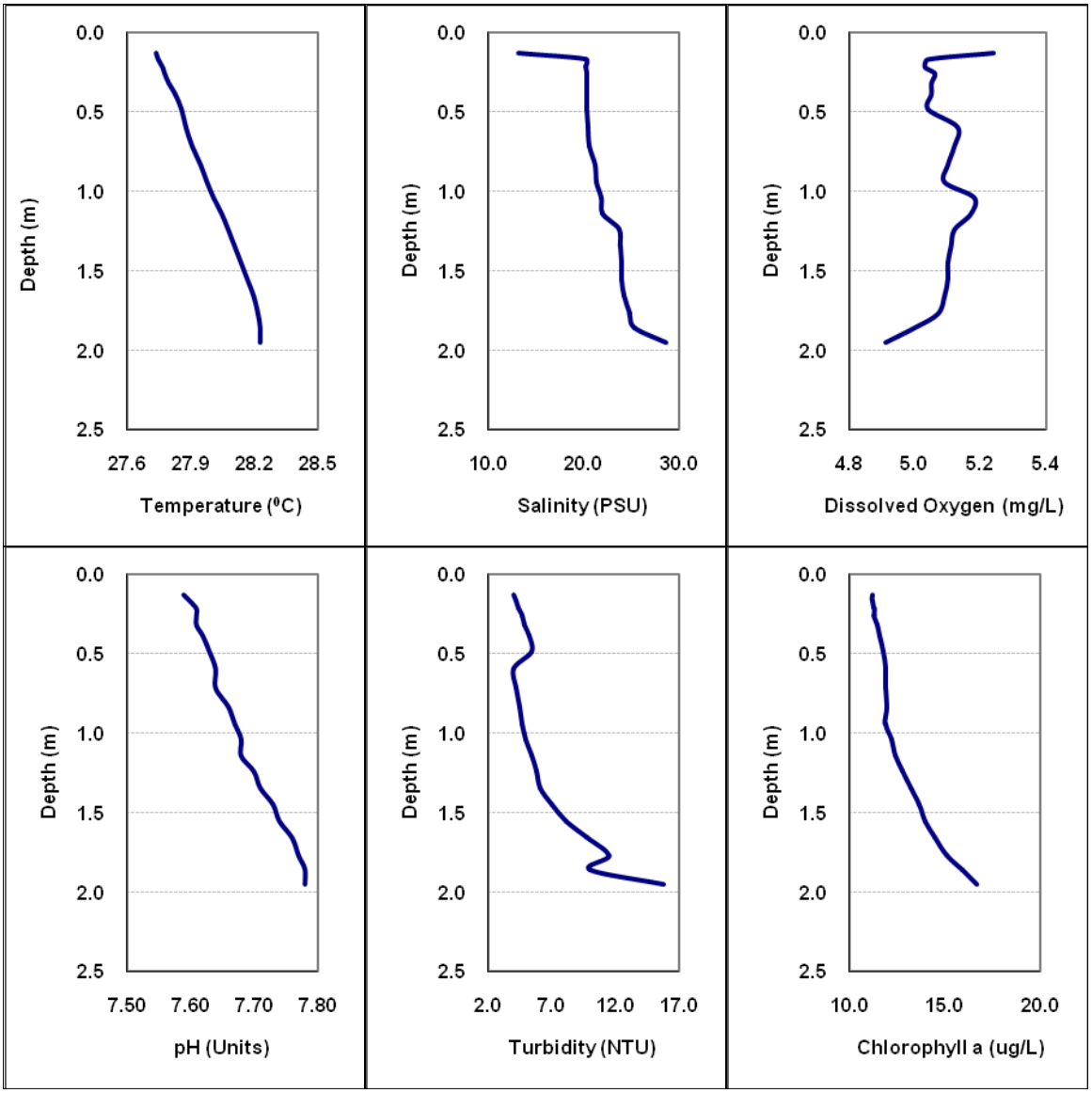

Figure 48: Boynton-Delray water quality monitoring YSI cast at station BD-18 October 2007.

9.4 FEBRUARY 2008

Water quality monitoring was conducted on February 14th and 18th, 2008 from the RV Nancy Foster. The inlet stations were collected by small boat on the 18th. All stations were sampled for all water quality parameters listed in Table 2. Vertical water column profiles were collected by using the ships seabird 911 CTD. No trip or equipment blanks were collected for the cruise. The times and dates of sample collection are listed in Table

10. The water quality data is listed below in Tables 11-13. Water column profiles can be seen in Figures 59-69.

The tides on February 14th, 2008 were (03:02; 15:07) High and (09:50; 22:21) Low. On February 18th, 2008 tides were (07:33; 19:44) High and (01:44; 14:16) Low. The seas were 2 to 4 feet with winds from the NE at 10-15knots during February 14th, while seas were 4-6 feet with winds from the south at 15-20knots on February 18th. The current flow was northerly during both days of sampling. Stations BD-9, BD-12 and BD-14 were not sampled due to depth restrictions of the RV Nancy Foster and sea conditions for small boat operations. A total of 4 duplicates were collected for the water quality parameters sampled. The Boynton Inlet was sampled on an incoming tidal cycle. The surface boil was not visible at the surface so the sample was collected at the appropriate coordinates for the South Central Outfall.

The NO_3-N+NO_2-N values ranged from 0.09µM to 1.48µM over the reef and outfall area, while the Boynton Inlet and LWL values ranged from 3.30µM to 6.70µM. NH_4-N were not collected due to the 10 day length of the trip and not being able to analyze the samples in an appropriate time frame to achieve reparable results. Ortho-PO_4-P values ranged from BDL to 0.10µM over the reef and outfall sites, while values varied from 0.43µM to 0.84µM for the Boynton Inlet and LWL. SiO_4-Si results were BDL for all the reef and outfall sites, while the Boynton Inlet and LWL sites varied from 9.90µM to 17.30µM. TDN values ranged from 0.65µM to 18.12µM over the reef and outfall area, while values varied from 16.69µM to 20.77µM for the Boynton Inlet and LWL sites. DOC values varied from 46.29µM to 118.64µM for the reef and outfall sampling sites, while the Boynton inlet and LWL sites varied from 168.56µM to 225.05µM.

Salinity values ranged from 35.09 to 36.13 salinity units over the reef and outfall, while values varied from 24.10 to 24.50 salinity units for the Boynton inlet and LWL. Temperature values ranged from 23.8^{0}C to 24.5^{0}C for the reef and outfall sites, while the Boynton Inlet and LWL sites varied from 27.7^{0}C to 29.3^{0}C. The difference in temperature may be due to the reef and outfall stations being collected during the night and the Inlet samples being collected during the daylight hours. pH values ranged from 8.03 to 8.18 units over the reef and outfall area, while the Boynton Inlet and LWL had values ranging from 7.75 to 8.01 units. Chlorophyll values varied from 0.184 µg/L to 0.586µg/L at the reef and outfall sites, while the Boynton Inlet and LWL sites varied from 2.31µg/L to 8.26µg/L. TSS values ranged from 0.18mg/L to 0.61mg/L for the reef and outfall, while values ranged from 1.40mg/l to 3.08mg/L for the Boynton Inlet and LWL.

Vertical water column casts were completed for all stations except BD-9, BD-12, BD-14, BD-16, BD-17 and BD-18. No large changes in temperature, salinity dissolved oxygen or chlorophyll were observed in any of the water column profiles.

Table 18: Date and Time of water sample collection for February 2008.

Date	Time (Local)	Station	Latitude	Longitude	Depth (m)
2/14/2008	N/A	BD-1A	26.42550	-80.04545	0
2/14/2008	N/A	BD-1B	26.42550	-80.04545	16
2/14/2008	N/A	BD-1C	26.42550	-80.04545	35
2/14/2008	N/A	BD-2A	26.44201	-80.04729	0
2/14/2008	N/A	BD-2B	26.44201	-80.04729	8
2/14/2008	N/A	BD-2C	26.44201	-80.04729	16
2/14/2008	N/A	BD-3A	26.45828	-80.04247	0
2/14/2008	N/A	BD-3B	26.45828	-80.04247	16
2/14/2008	N/A	BD-3C	26.45828	-80.04247	33
2/14/2008	N/A	BD-4A	26.46192	-80.04195	0
2/14/2008	N/A	BD-4B	26.46192	-80.04195	16
2/14/2008	N/A	BD-4C	26.46192	-80.04195	32
2/14/2008	N/A	BD-5A	26.46620	-80.04167	0
2/14/2008	N/A	BD-5B	26.46620	-80.04167	15
2/14/2008	N/A	BD-5C	26.46620	-80.04167	30
2/14/2008	N/A	BD-6A	26.47532	-80.03976	0
2/14/2008	N/A	BD-6B	26.47532	-80.03976	15
2/14/2008	N/A	BD-6C	26.47532	-80.03976	30
2/14/2008	N/A	BD-7A	26.48737	-80.03871	0
2/14/2008	N/A	BD-7B	26.48737	-80.03871	10
2/14/2008	N/A	BD-7C	26.48737	-80.03871	20
2/14/2008	N/A	BD-8A	26.51507	-80.03542	0
2/14/2008	N/A	BD-8B	26.51507	-80.03542	10
2/14/2008	N/A	BD-8C	26.51507	-80.03542	20
2/14/2008	N/A	BD-9A	26.50838	-80.04129	0
2/14/2008	N/A	BD-9B	26.50838	-80.04129	7
2/14/2008	N/A	BD-9C	26.50838	-80.04129	15
2/14/2008	N/A	BD-10A	26.52261	-80.03223	0
2/14/2008	N/A	BD-10B	26.52261	-80.03223	8
2/14/2008	N/A	BD-10C	26.52261	-80.03223	16
2/14/2008	N/A	BD-11A	26.53333	-80.03584	0
2/14/2008	N/A	BD-11B	26.53333	-80.03584	7
2/14/2008	N/A	BD-11C	26.53333	-80.03584	13
2/14/2008	N/A	BD-12A	26.53874	-80.03980	0
2/14/2008	N/A	BD-12B	26.53874	-80.03980	5
2/14/2008	N/A	BD-12C	26.53874	-80.03980	8
2/18/2008	N/A	BD-13A	26.54542	-80.04300	0
2/14/2008	N/A	BD-14A	26.54242	-80.03996	0
2/14/2008	N/A	BD-14C	26.54242	-80.03996	3
2/14/2008	N/A	BD-15A	26.55919	-80.03329	0
2/14/2008	N/A	BD-15B	26.55919	-80.03329	6
2/14/2008	N/A	BD-15C	26.55919	-80.03329	13
2/18/2008	N/A	BD-16A	26.54618	-80.04791	0
2/18/2008	N/A	BD-17A	26.54264	-80.04790	0
2/18/2008	N/A	BD-18A	26.53950	-80.04951	0

Table 19: February 2008 Boynton-Delray nutrient and DOC values in µM.

Station	Depth (m)	N+N (µM)	NH4 (µM)	P (µM)	Si (µM)	TDN (µM)	DOC (µM)
BD-1A	0	0.45	N/A	0.04	BDL	6.18	77.01
BD-1B	16	0.50	N/A	BDL	BDL	3.20	118.64
BD-1C	35	0.55	N/A	BDL	BDL	2.73	90.18
BD-2A	0	0.57	N/A	BDL	BDL	5.30	70.60
BD-2B	8	0.53	N/A	BDL	BDL	3.99	78.35
BD-2C	16	0.55	N/A	BDL	BDL	2.36	62.59
BD-3A	0	1.48	N/A	0.10	BDL	18.12	115.95
BD-3B	16	0.51	N/A	0.07	BDL	7.19	114.24
BD-3C	33	0.43	N/A	0.03	BDL	4.99	94.75
BD-4A	0	0.56	N/A	0.03	BDL	4.26	81.22
BD-4B	16	0.29	N/A	0.03	BDL	N/A	69.49
BD-4C	32	0.66	N/A	BDL	BDL	5.43	58.75
BD-5A	0	0.48	N/A	0.04	BDL	4.94	71.13
BD-5B	15	0.40	N/A	0.04	BDL	4.37	63.41
BD-5C	30	0.39	N/A	BDL	BDL	4.60	53.26
BD-6A	0	0.16	N/A	BDL	BDL	3.50	64.10
BD-6B	15	0.17	N/A	BDL	BDL	5.74	65.08
BD-6C	30	0.24	N/A	BDL	BDL	0.65	46.29
BD-7A	0	0.24	N/A	BDL	BDL	3.87	61.63
BD-7B	10	0.22	N/A	BDL	BDL	6.11	101.84
BD-7C	20	0.26	N/A	BDL	BDL	3.33	79.24
BD-8A	0	0.17	N/A	0.03	BDL	2.49	77.93
BD-8B	10	0.18	N/A	BDL	BDL	4.19	64.03
BD-8C	20	0.52	N/A	BDL	BDL	4.49	54.86
BD-9A	0	N/A	N/A	N/A	N/A	N/A	N/A
BD-9B	7	N/A	N/A	N/A	N/A	N/A	N/A
BD-9C	15	N/A	N/A	N/A	N/A	N/A	N/A
BD-10A	0	0.15	N/A	BDL	BDL	1.83	52.04
BD-10B	8	0.12	N/A	BDL	BDL	3.52	67.61
BD-10C	16	0.09	N/A	BDL	BDL	3.32	103.06
BD-11A	0	0.18	N/A	0.05	BDL	2.31	91.81
BD-11B	7	0.22	N/A	BDL	BDL	2.64	74.61
BD-11C	13	0.12	N/A	BDL	BDL	3.63	77.99
BD-12A	0	N/A	N/A	N/A	N/A	N/A	N/A
BD-12B	5	N/A	N/A	N/A	N/A	N/A	N/A
BD-12C	8	N/A	N/A	N/A	N/A	N/A	N/A
BD-13A	0	3.30	N/A	0.43	9.60	19.72	219.37
BD-14A	0	N/A	N/A	N/A	N/A	N/A	N/A
BD-14C	3	N/A	N/A	N/A	N/A	N/A	N/A
BD-15A	0	0.39	N/A	0.06	BDL	4.30	76.81
BD-15B	6	0.31	N/A	0.03	BDL	3.02	89.53
BD-15C	13	0.34	N/A	BDL	BDL	5.95	74.84
BD-16A	0	5.00	N/A	0.73	17.30	19.38	226.05
BD-17A	0	6.70	N/A	0.72	9.90	20.77	221.65
BD-18A	0	4.50	N/A	0.84	12.00	16.69	168.56

Table 20: February 2008 Boynton-Delray nutrient and DOC values in mg/L.

Station	Depth (m)	N+N (mg/L)	NH4 (mg/L)	P (mg/L)	Si (mg/L)	TDN (mg/L)	DOC (mg/L)
BD-1A	0	0.006	N/A	0.001	BDL	0.07	0.94
BD-1B	16	0.007	N/A	BDL	BDL	0.04	1.46
BD-1C	35	0.008	N/A	BDL	BDL	0.03	1.11
BD-2A	0	0.008	N/A	BDL	BDL	0.06	0.87
BD-2B	8	0.007	N/A	BDL	BDL	0.05	0.96
BD-2C	16	0.008	N/A	BDL	BDL	0.03	0.77
BD-3A	0	0.021	N/A	0.003	BDL	0.22	1.42
BD-3B	16	0.007	N/A	0.002	BDL	0.09	1.40
BD-3C	33	0.006	N/A	0.001	BDL	0.06	1.16
BD-4A	0	0.008	N/A	0.001	BDL	0.05	1.00
BD-4B	16	0.004	N/A	0.001	BDL	N/A	0.85
BD-4C	32	0.009	N/A	BDL	BDL	0.07	0.72
BD-5A	0	0.007	N/A	0.001	BDL	0.06	0.87
BD-5B	15	0.006	N/A	0.001	BDL	0.05	0.78
BD-5C	30	0.005	N/A	BDL	BDL	0.06	0.65
BD-6A	0	0.002	N/A	BDL	BDL	0.04	0.79
BD-6B	15	0.002	N/A	BDL	BDL	0.07	0.80
BD-6C	30	0.003	N/A	BDL	BDL	0.01	0.57
BD-7A	0	0.003	N/A	BDL	BDL	0.05	0.76
BD-7B	10	0.003	N/A	BDL	BDL	0.07	1.25
BD-7C	20	0.004	N/A	BDL	BDL	0.04	0.97
BD-8A	0	0.002	N/A	0.001	BDL	0.03	0.96
BD-8B	10	0.003	N/A	BDL	BDL	0.05	0.79
BD-8C	20	0.007	N/A	BDL	BDL	0.05	0.67
BD-9A	0	N/A	N/A	N/A	N/A	N/A	N/A
BD-9B	7	N/A	N/A	N/A	N/A	N/A	N/A
BD-9C	15	N/A	N/A	N/A	N/A	N/A	N/A
BD-10A	0	0.002	N/A	BDL	BDL	0.02	0.64
BD-10B	8	0.002	N/A	BDL	BDL	0.04	0.83
BD-10C	16	0.001	N/A	BDL	BDL	0.04	1.26
BD-11A	0	0.003	N/A	0.002	BDL	0.03	1.13
BD-11B	7	0.003	N/A	BDL	BDL	0.03	0.92
BD-11C	13	0.002	N/A	BDL	BDL	0.04	0.96
BD-12A	0	N/A	N/A	N/A	N/A	N/A	N/A
BD-12B	5	N/A	N/A	N/A	N/A	N/A	N/A
BD-12C	8	N/A	N/A	N/A	N/A	N/A	N/A
BD-13A	0	0.046	N/A	0.013	0.269	0.24	2.69
BD-14A	0	N/A	N/A	N/A	N/A	N/A	N/A
BD-14C	3	N/A	N/A	N/A	N/A	N/A	N/A
BD-15A	0	0.005	N/A	0.002	BDL	0.05	0.94
BD-15B	6	0.004	N/A	0.001	BDL	0.04	1.10
BD-15C	13	0.005	N/A	BDL	BDL	0.07	0.92
BD-16A	0	0.070	N/A	0.023	0.484	0.23	2.77
BD-17A	0	0.094	N/A	0.022	0.277	0.25	2.72
BD-18A	0	0.063	N/A	0.026	0.336	0.20	2.07

Table 21: February 2008 Boynton-Delray pH, TSS, Chlorophyll.

Station	Depth (m)	Temperature (^{0}C)	Salinity (Units)	pH (Units)	Chlorophyll a (μg/L)	Phaeopigments (μg/L)	TSS (mg/L)
BD-1A	0	24.3	36.08	8.12	0.361	0.160	0.400
BD-1B	16	24.1	36.04	8.13	0.586	0.177	0.410
BD-1C	35	24.1	36.02	8.14	0.284	0.206	0.460
BD-2A	0	24.1	36.10	8.11	0.346	0.153	0.540
BD-2B	8	23.9	35.96	8.11	0.325	0.173	0.600
BD-2C	16	23.8	35.95	8.12	0.318	0.137	0.540
BD-3A	0	24.2	35.90	8.03	0.333	0.182	0.610
BD-3B	16	24.3	36.06	8.16	0.359	0.192	0.380
BD-3C	33	24.2	36.06	8.18	0.364	0.167	0.450
BD-4A	0	24.3	36.09	8.16	0.359	0.192	0.390
BD-4B	16	24.4	26.09	8.17	0.386	0.170	0.310
BD-4C	32	24.4	36.09	8.18	0.253	0.146	0.380
BD-5A	0	24.3	36.10	8.14	0.300	0.128	0.460
BD-5B	15	24.3	36.10	8.15	0.299	0.148	0.310
BD-5C	30	24.2	36.12	8.17	0.291	0.159	0.350
BD-6A	0	24.4	36.12	8.14	0.225	0.101	0.290
BD-6B	15	24.4	36.12	8.14	0.256	0.124	0.270
BD-6C	30	24.4	36.12	8.16	0.262	0.089	0.220
BD-7A	0	24.3	36.12	8.14	0.593	0.183	0.330
BD-7B	10	24.3	36.12	8.17	0.274	0.105	0.290
BD-7C	20	24.3	36.12	8.17	0.271	0.110	0.250
BD-8A	0	24.4	36.13	8.15	0.231	0.116	0.290
BD-8B	10	24.4	36.13	8.16	0.252	0.110	0.210
BD-8C	20	34.4	36.13	8.17	0.270	0.096	0.350
BD-9A	0	N/A	N/A	N/A	N/A	N/A	N/A
BD-9B	7	N/A	N/A	N/A	N/A	N/A	N/A
BD-9C	15	N/A	N/A	N/A	N/A	N/A	N/A
BD-10A	0	24.5	36.12	8.15	0.268	0.098	0.310
BD-10B	8	24.5	36.12	8.16	0.206	0.114	0.200
BD-10C	16	24.5	36.12	8.18	0.184	0.067	0.180
BD-11A	0	24.4	36.10	8.16	0.253	0.115	0.420
BD-11B	7	24.3	36.08	8.15	0.345	0.151	0.420
BD-11C	13	24.3	36.09	8.17	0.339	0.099	0.310
BD-12A	0	N/A	N/A	N/A	N/A	N/A	N/A
BD-12B	5	N/A	N/A	N/A	N/A	N/A	N/A
BD-12C	8	N/A	N/A	N/A	N/A	N/A	N/A
BD-13A	0	29.3	24.50	8.01	4.876	0.722	1.400
BD-14A	0	N/A	N/A	N/A	N/A	N/A	N/A
BD-14C	3	N/A	N/A	N/A	N/A	N/A	N/A
BD-15A	0	24.1	36.05	8.16	0.555	0.269	0.400
BD-15B	6	24.1	36.05	8.15	0.428	0.204	0.370
BD-15C	13	24.1	36.05	8.17	0.571	0.214	0.340
BD-16A	0	27.7	24.50	7.91	8.261	4.086	2.340
BD-17A	0	28.7	24.20	7.83	2.315	1.049	1.860
BD-18A	0	28.7	24.10	7.75	3.361	1.790	3.080

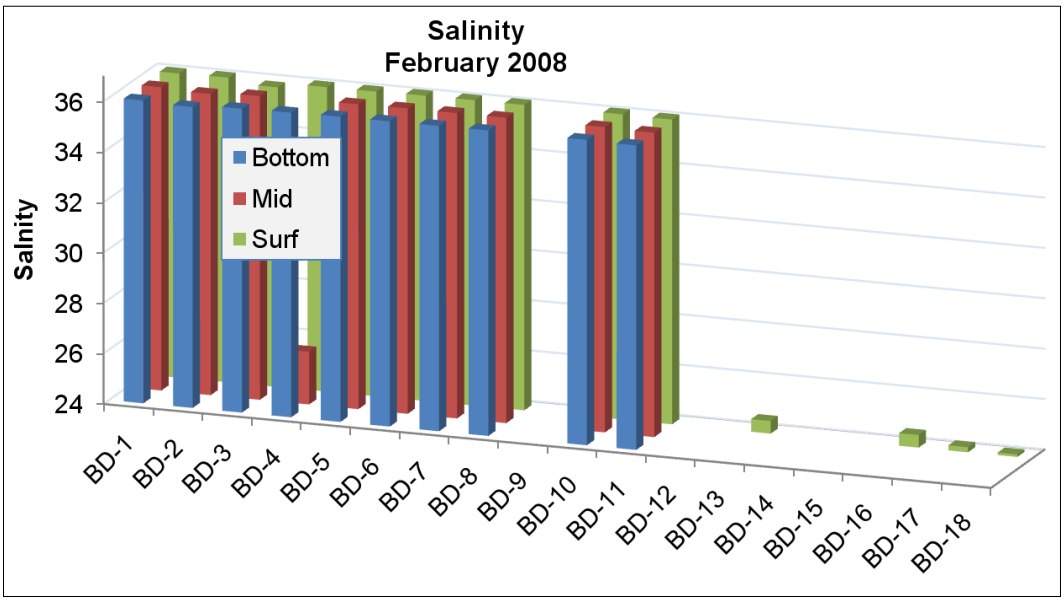

Figure 49: February 2008 salinity values for the Boynton-Delray water quality monitoring stations.

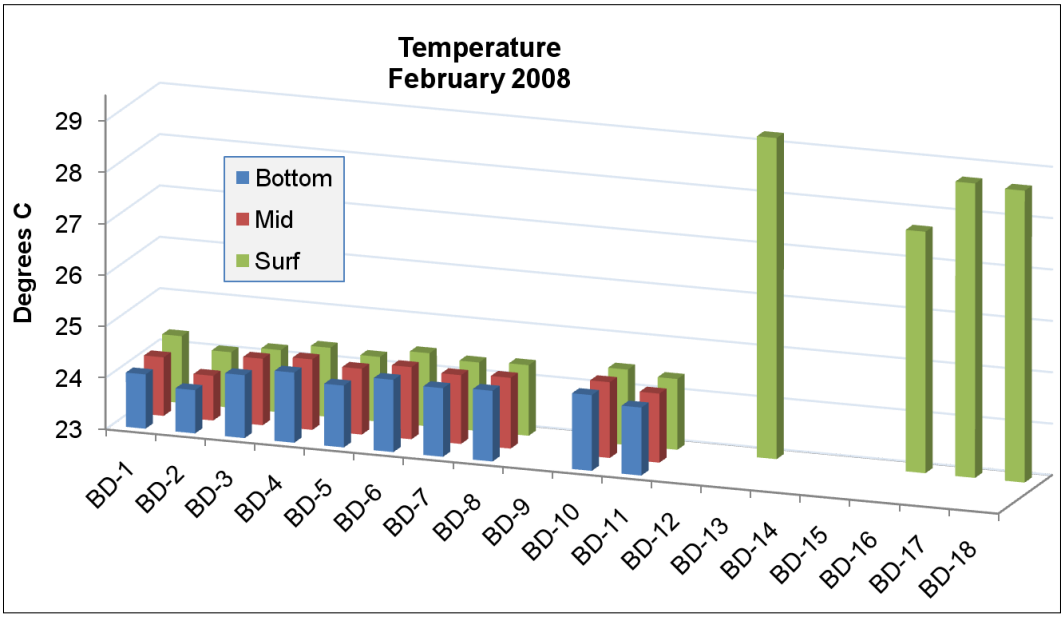

Figure 50: February 2008 temperature results for the Boynton-Delray water quality monitoring stations.

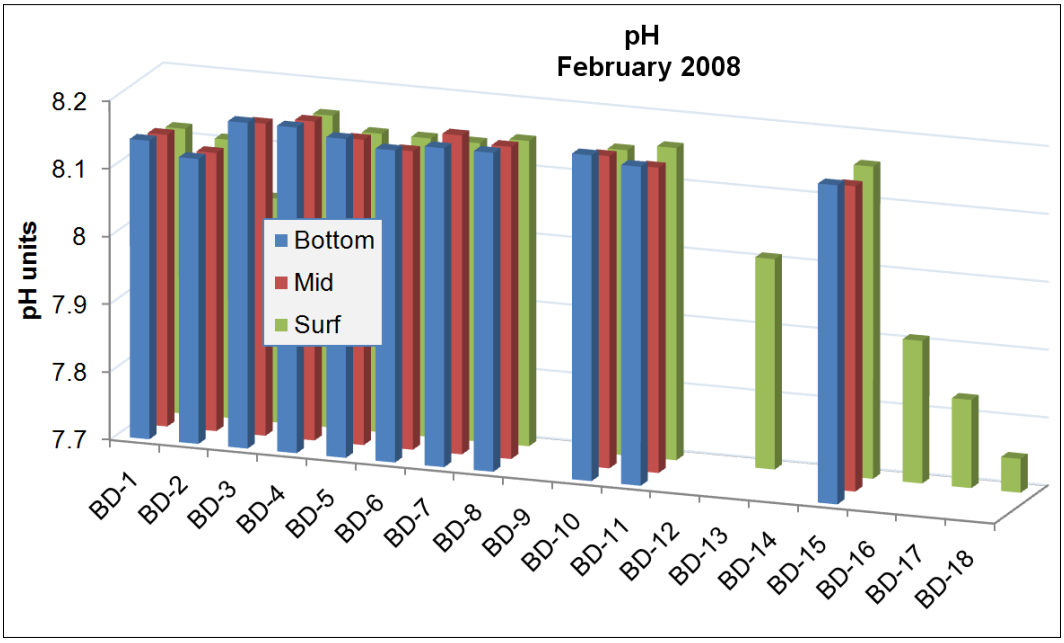

Figure 51: February 2008 pH measurements for the Boynton-Delray water quality monitoring stations.

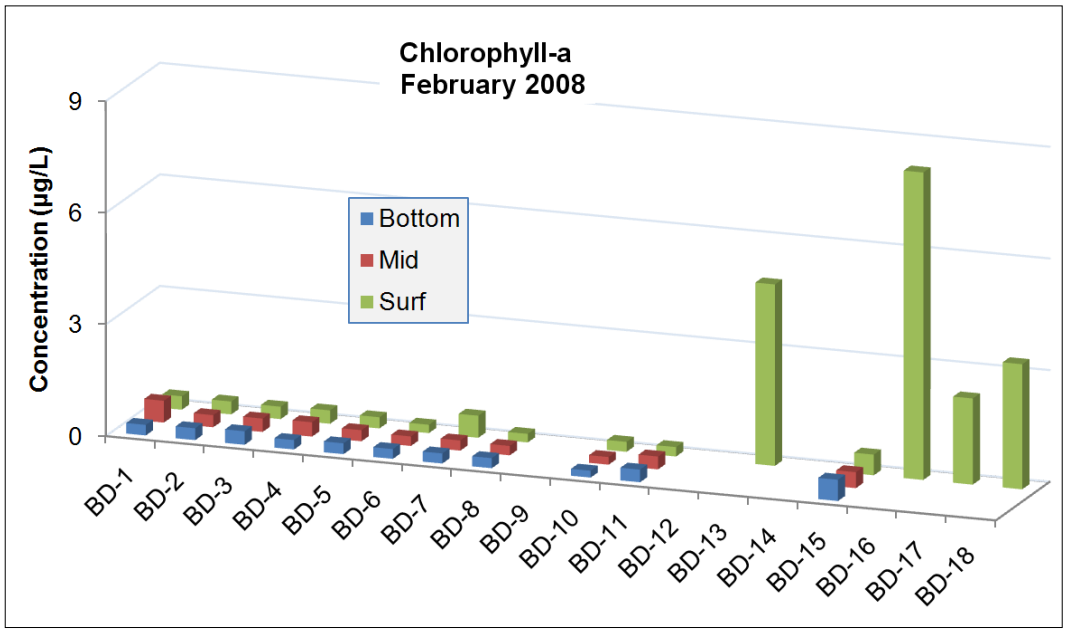

Figure 52: February 2008 chlorophyll concentrations for the Boynton-Delray water quality monitoring stations.

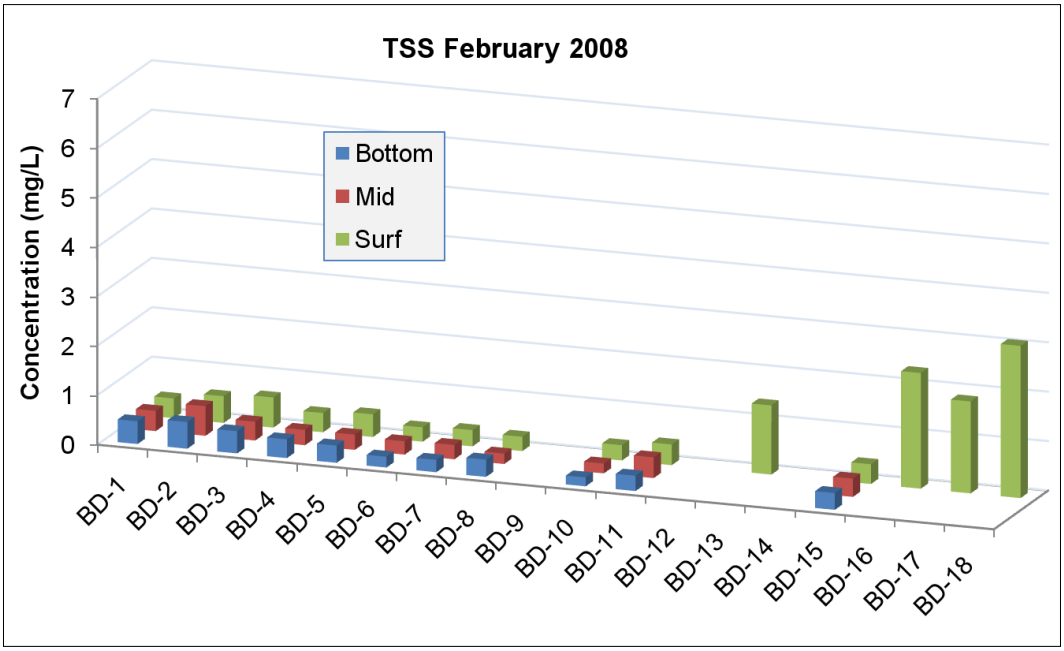

Figure 53: February 2008 TSS concentrations for the Boynton-Delray water quality monitoring stations.

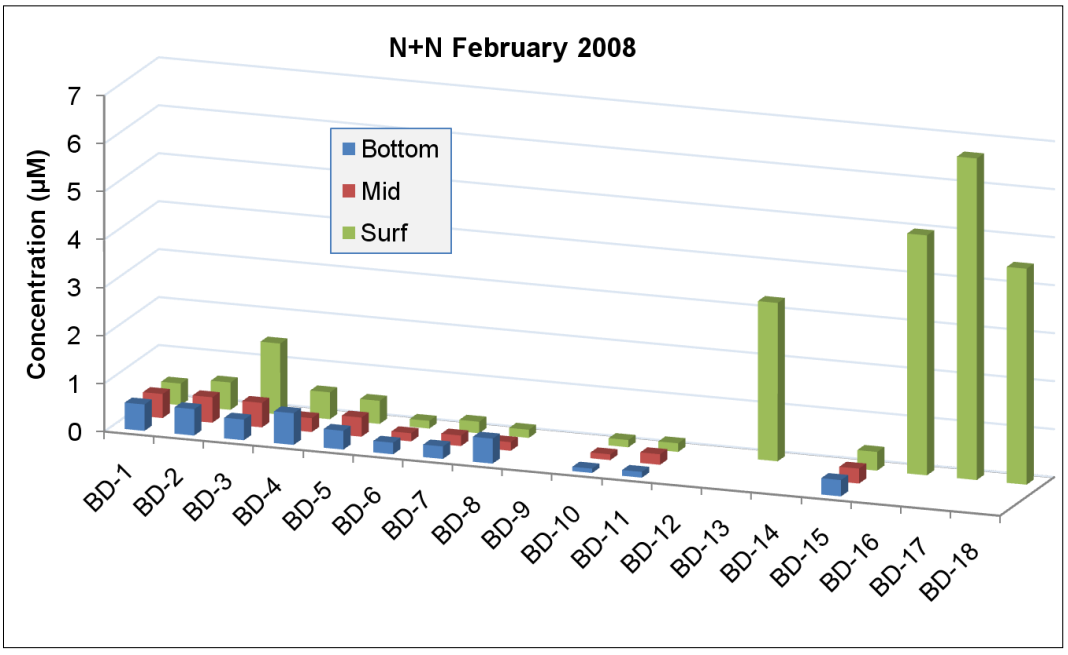

Figure 54: February 2008 N+N concentrations for the Boynton-Delray water quality monitoring stations.

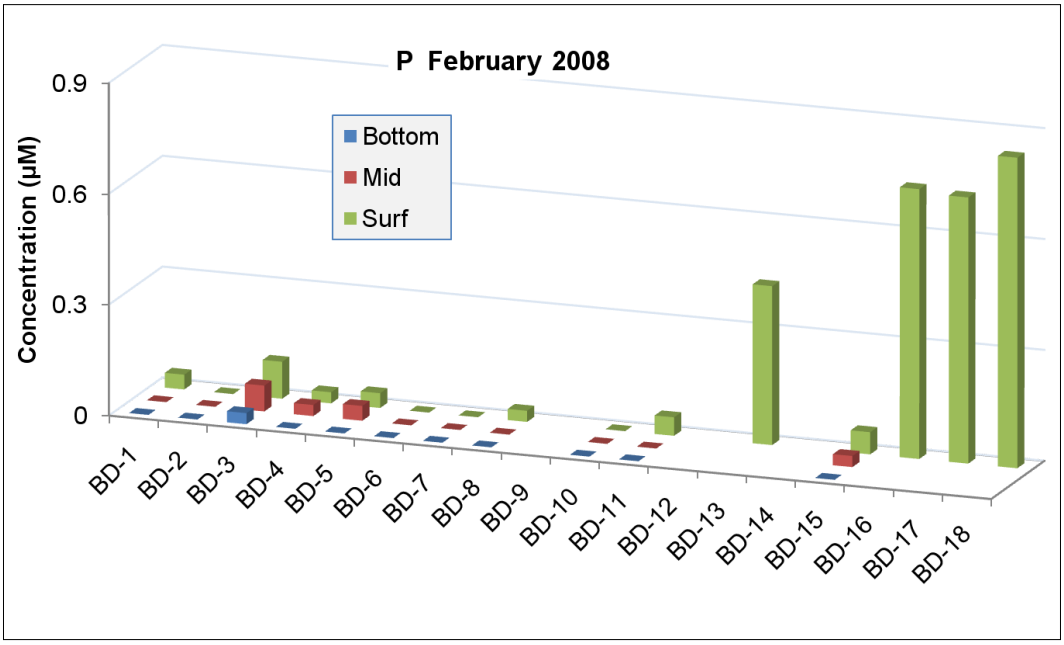

Figure 55: February 2008 P concentrations for the Boynton-Delray water quality monitoring stations.

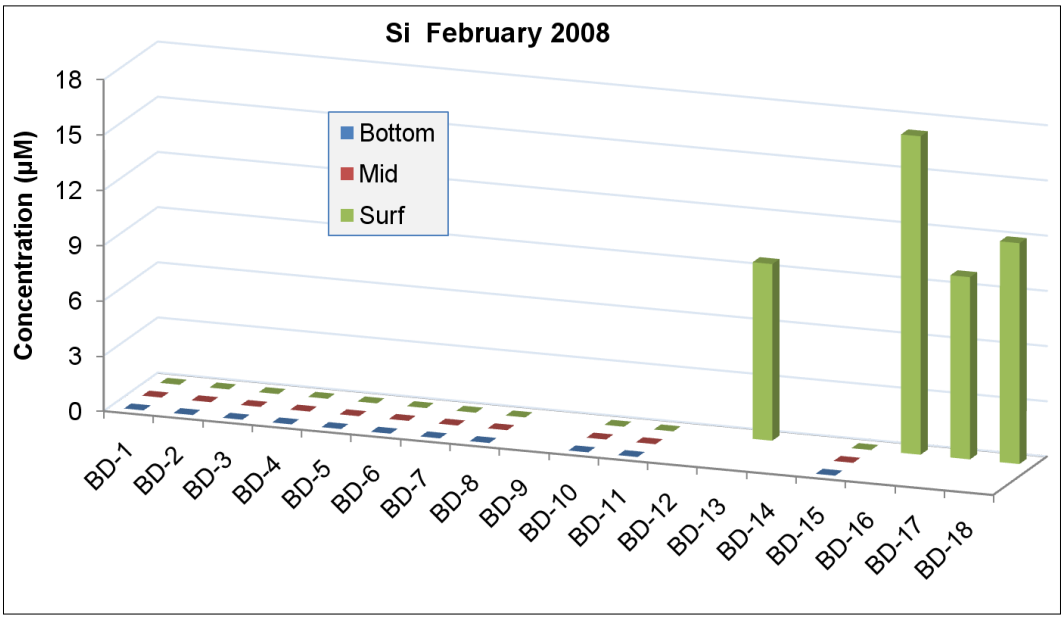

Figure 56: February 2008 Si concentrations for the Boynton-Delray water quality monitoring stations.

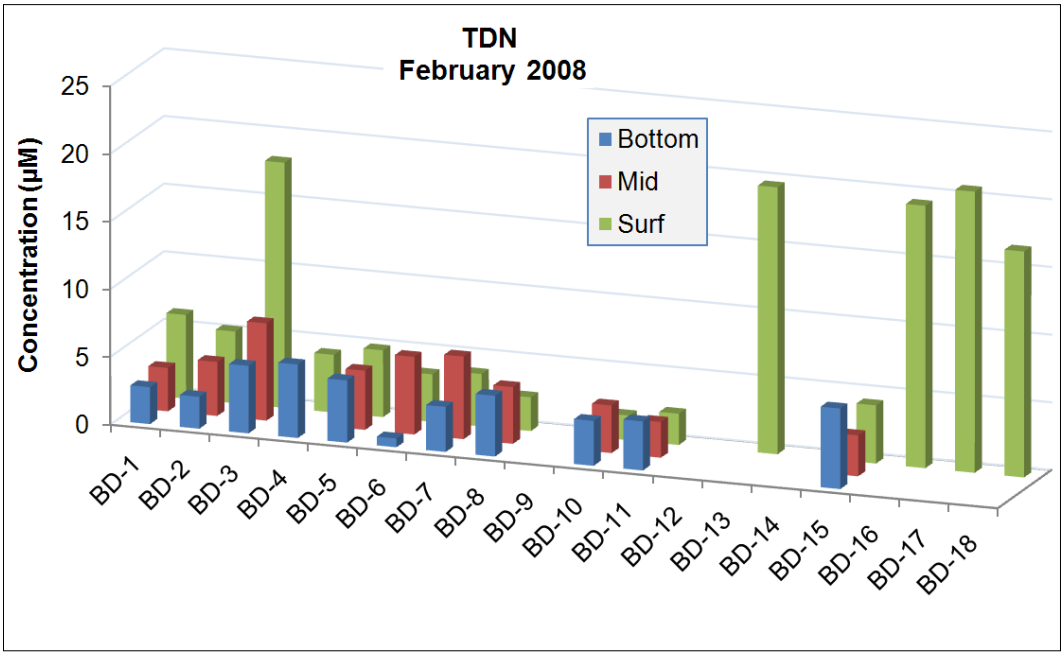

Figure 57: February 2008 TDN concentrations for the Boynton-Delray water quality monitoring stations.

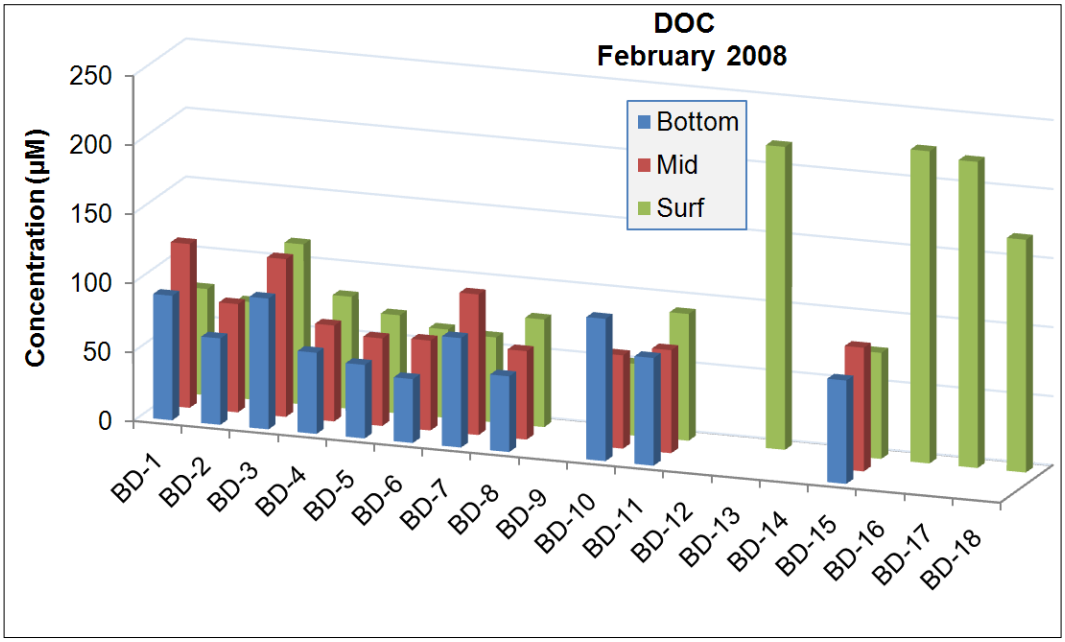

Figure 58: February 2008 DOC concentrations for the Boynton-Delray water quality monitoring stations.

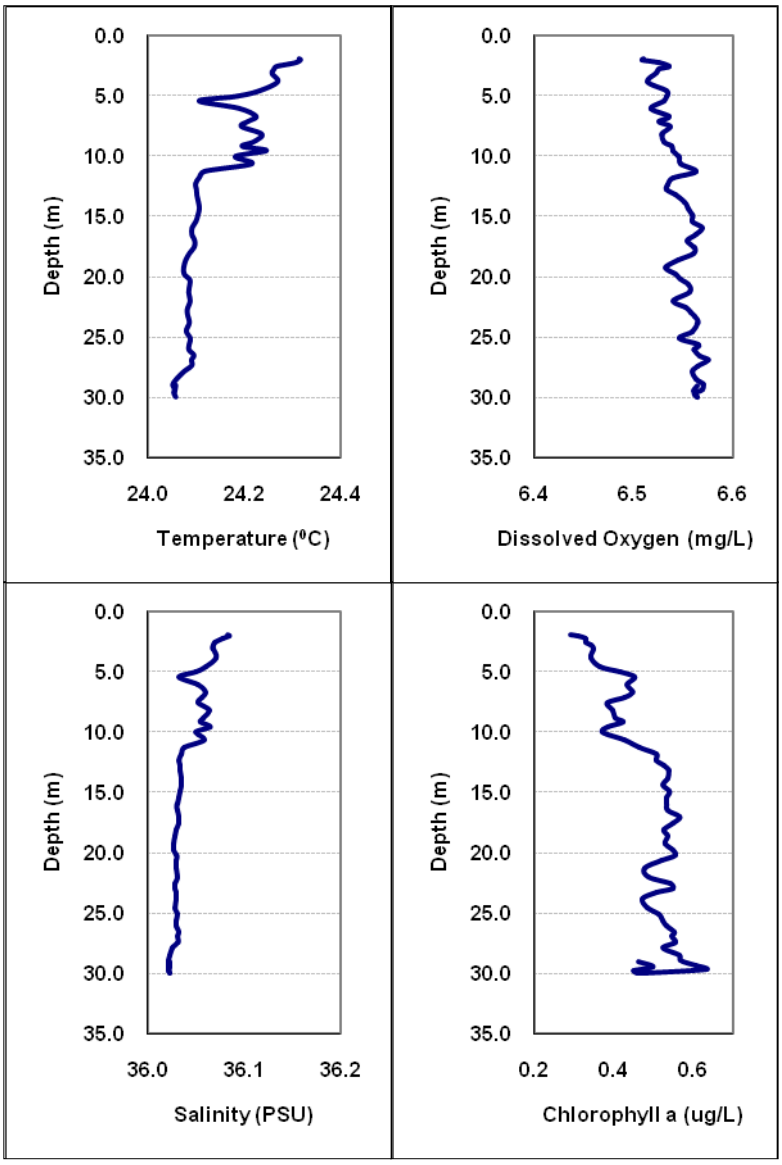

Figure 59: Boynton-Delray water quality monitoring CTD cast at station BD-1 February 2008.

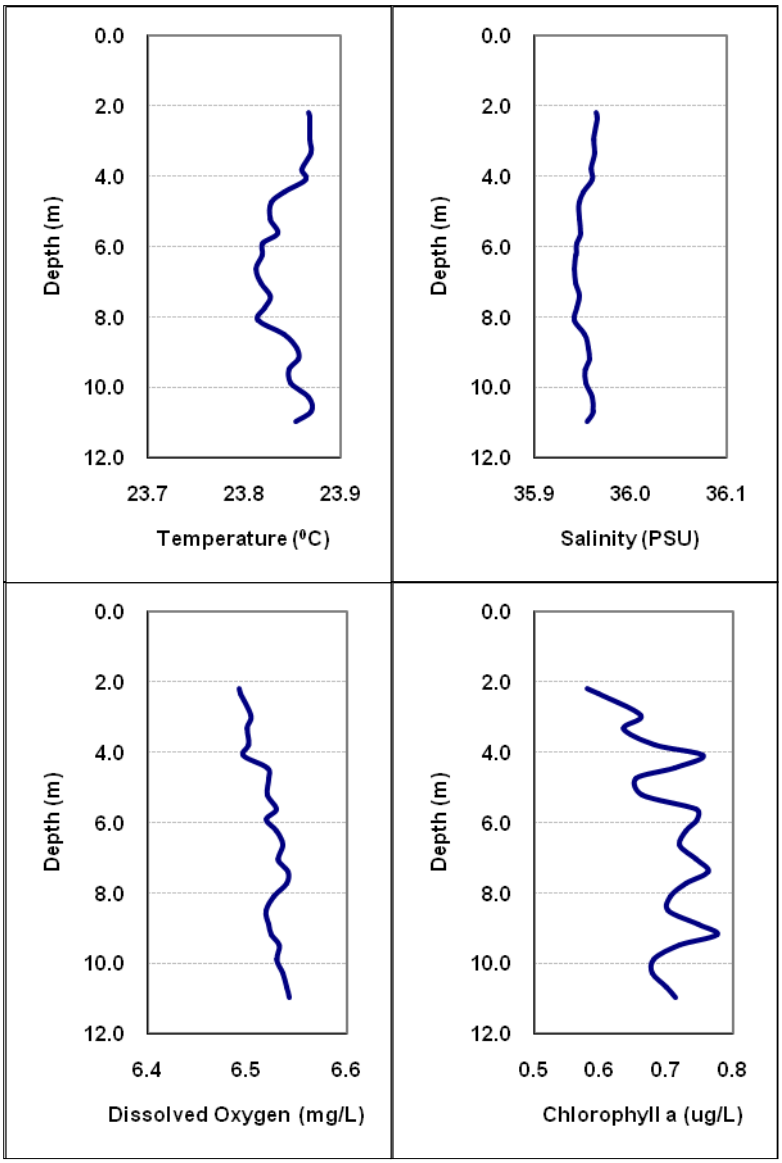

Figure 60: Boynton-Delray water quality monitoring CTD cast at station BD-2 February 2008.

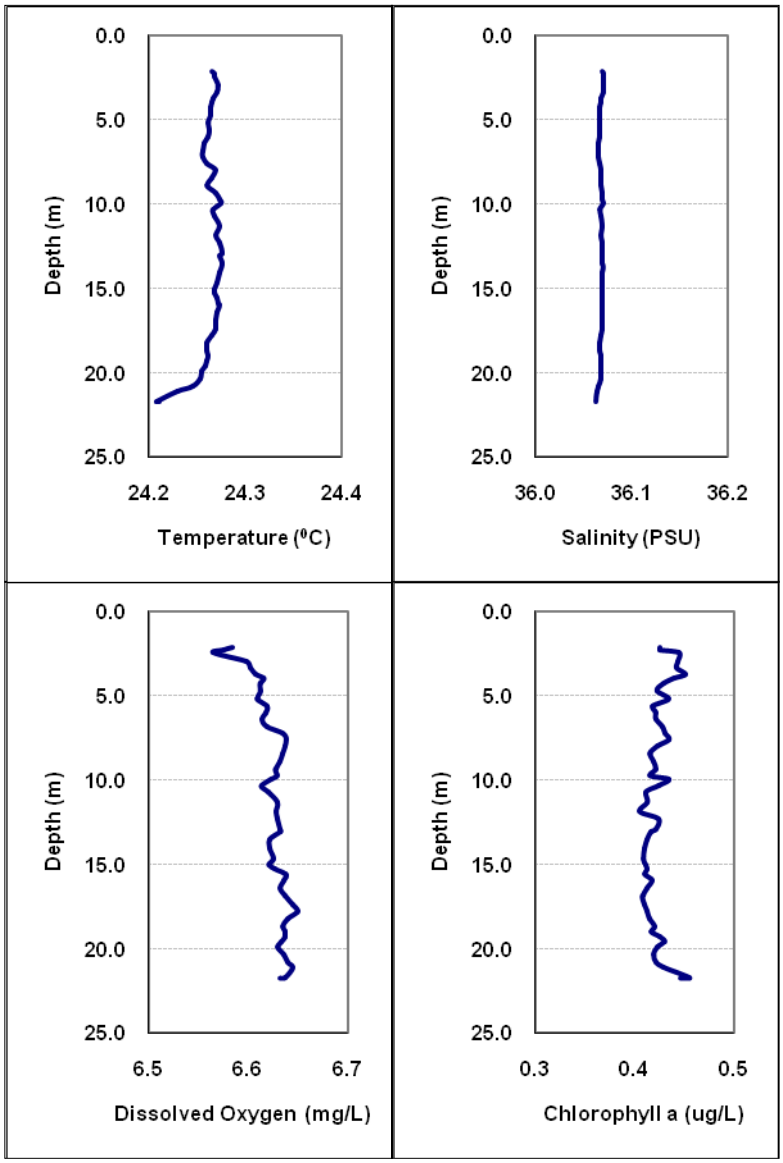

Figure 61: Boynton-Delray water quality monitoring CTD cast at station BD-3 February 2008.

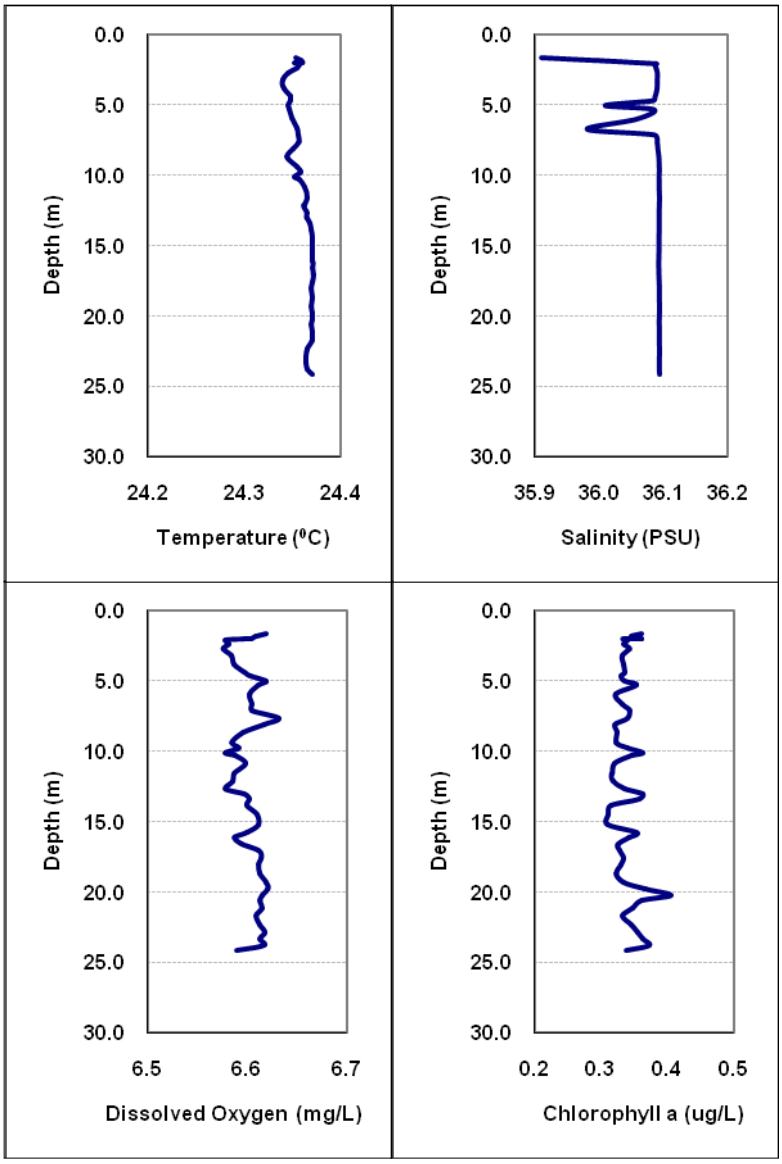

Figure 62: Boynton-Delray water quality monitoring CTD cast at station BD-4 February 2008.

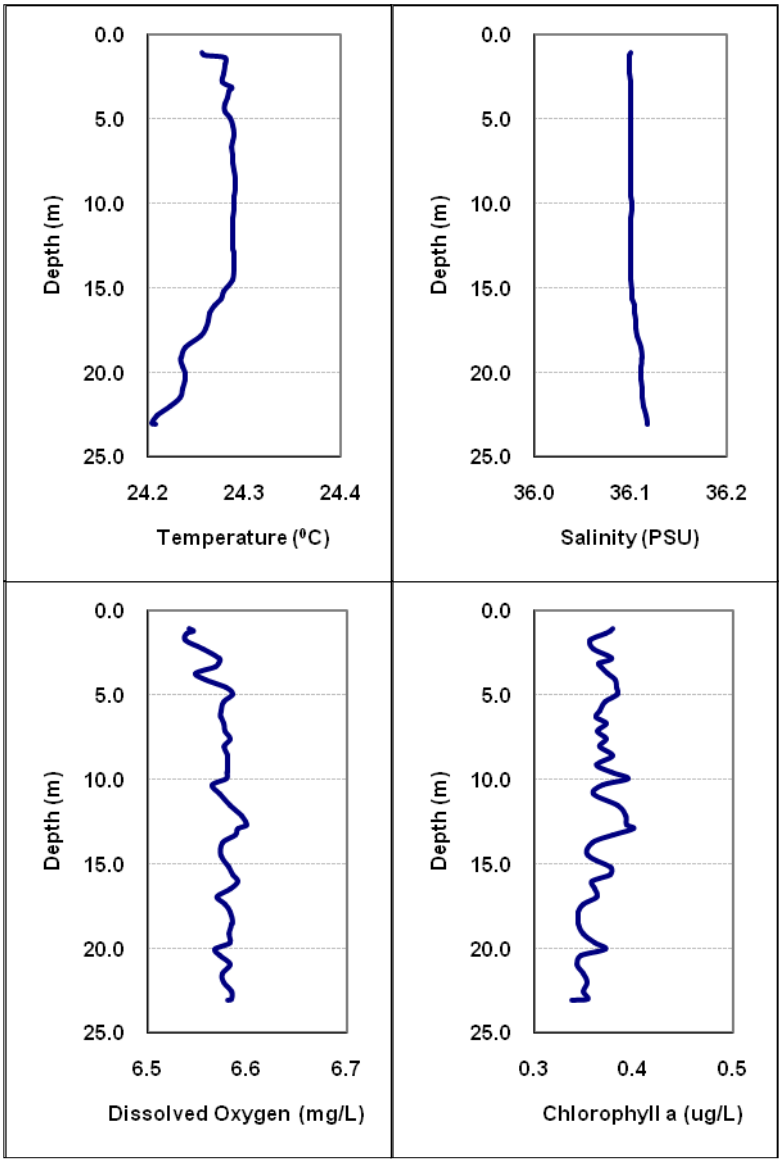

Figure 63: Boynton-Delray water quality monitoring CTD cast at station BD-5 February 2008.

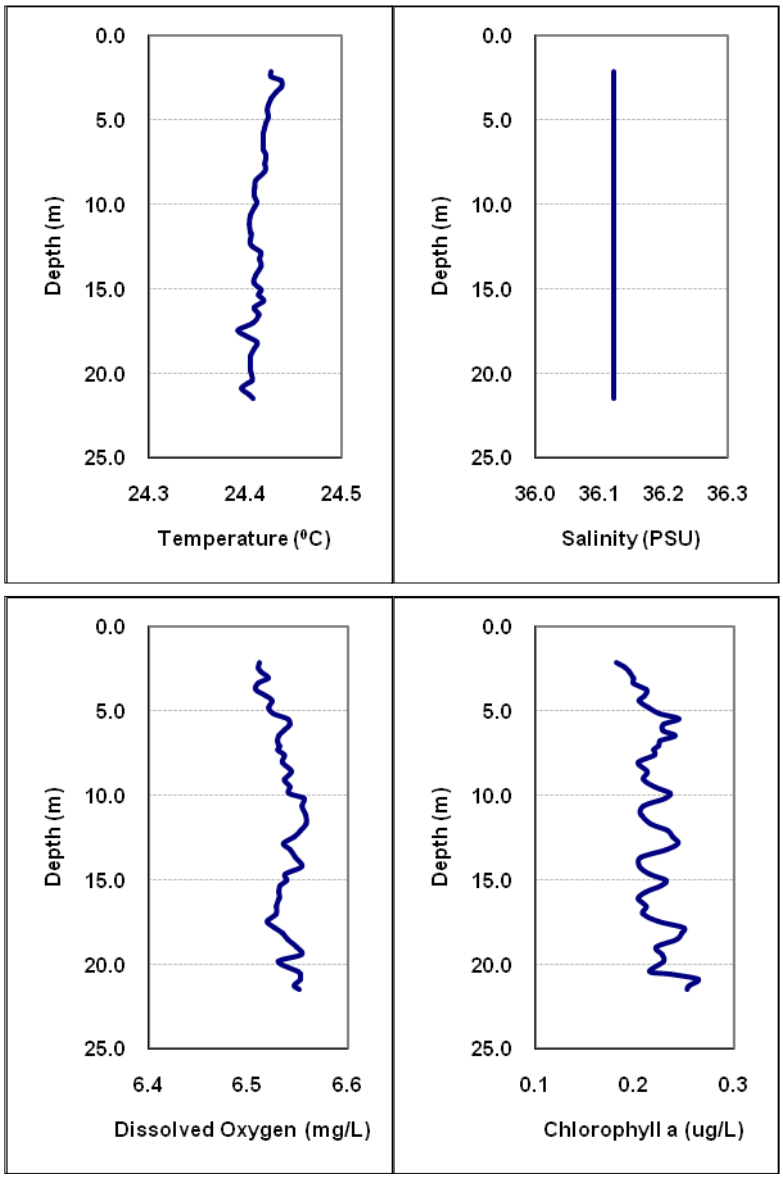

Figure 64: Boynton-Delray water quality monitoring CTD cast at station BD-6 February 2008.

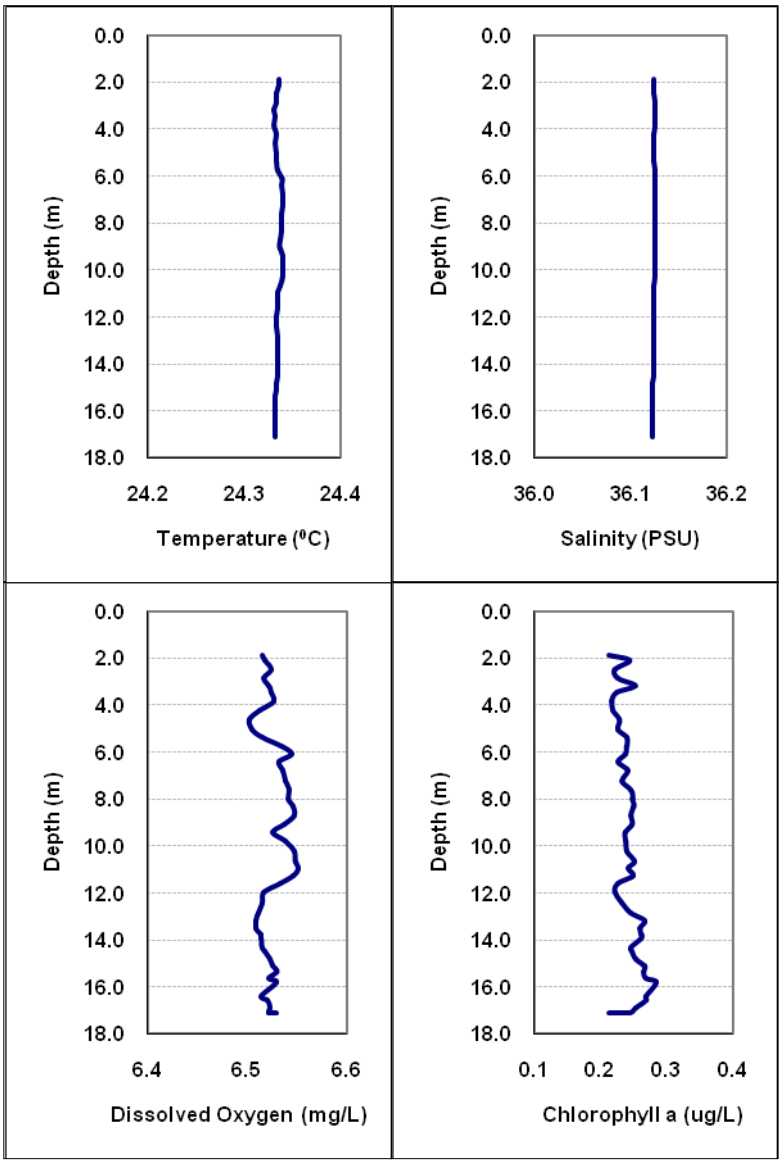

Figure 65: Boynton-Delray water quality monitoring CTD cast at station BD-7 February 2008.

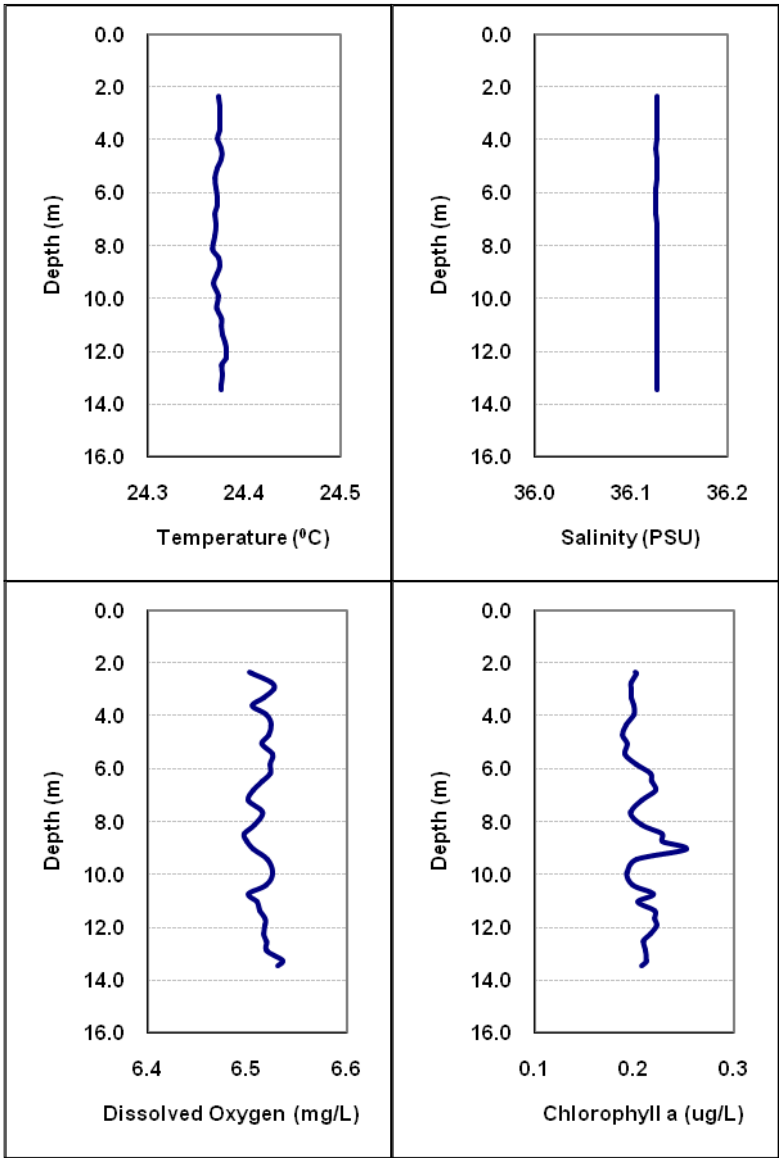

Figure 66: Boynton-Delray water quality monitoring CTD cast at station BD-8 February 2008.

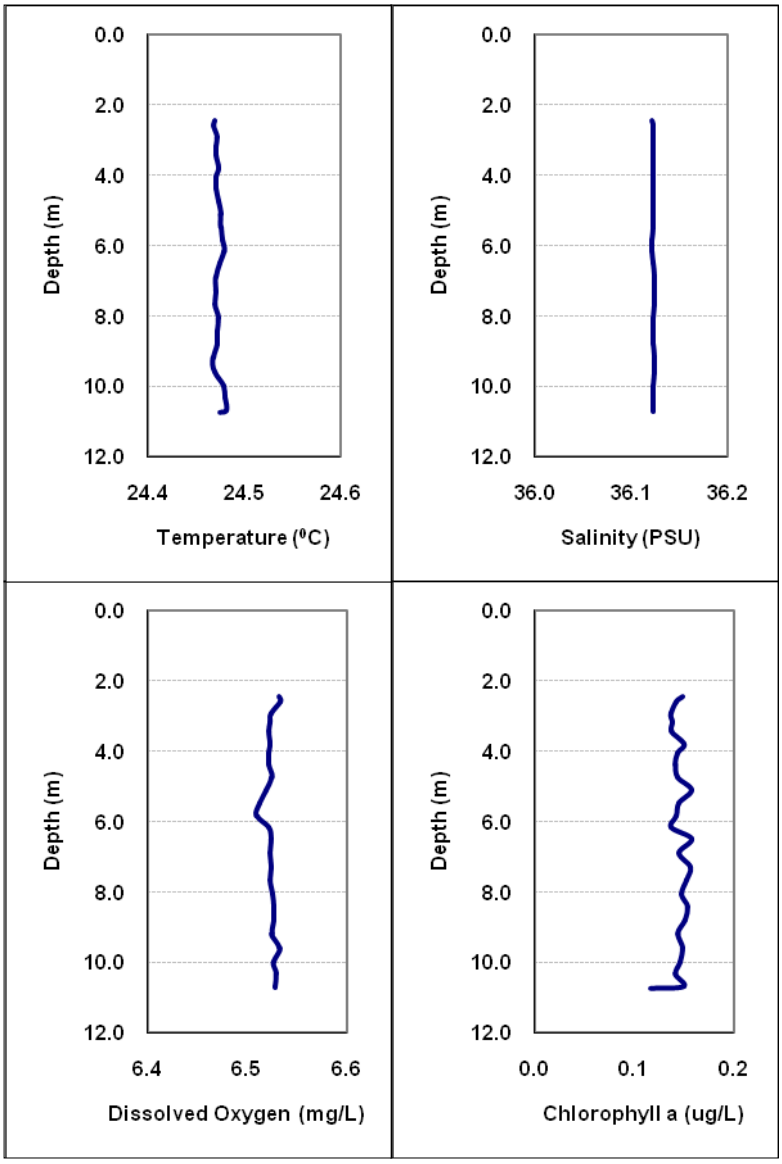

Figure 67: Boynton-Delray water quality monitoring CTD cast at station BD-10 February 2008.

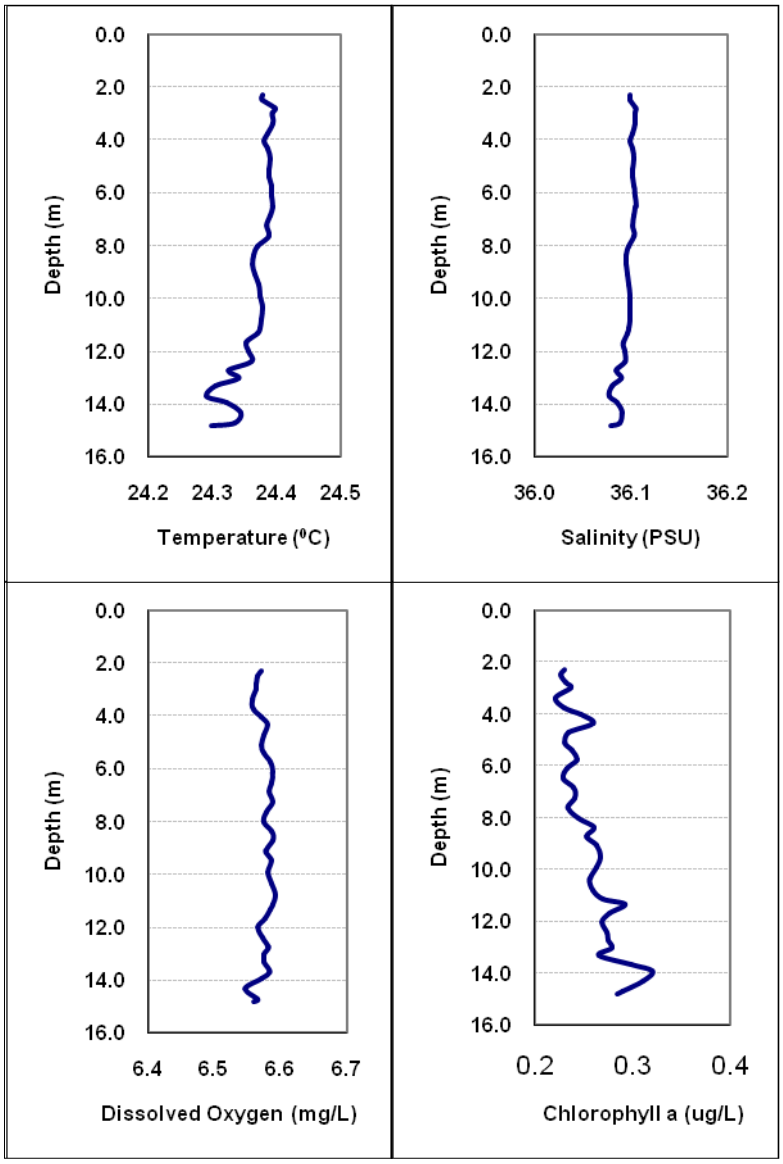

Figure 68: Boynton-Delray water quality monitoring CTD cast at station BD-11 February 2008.

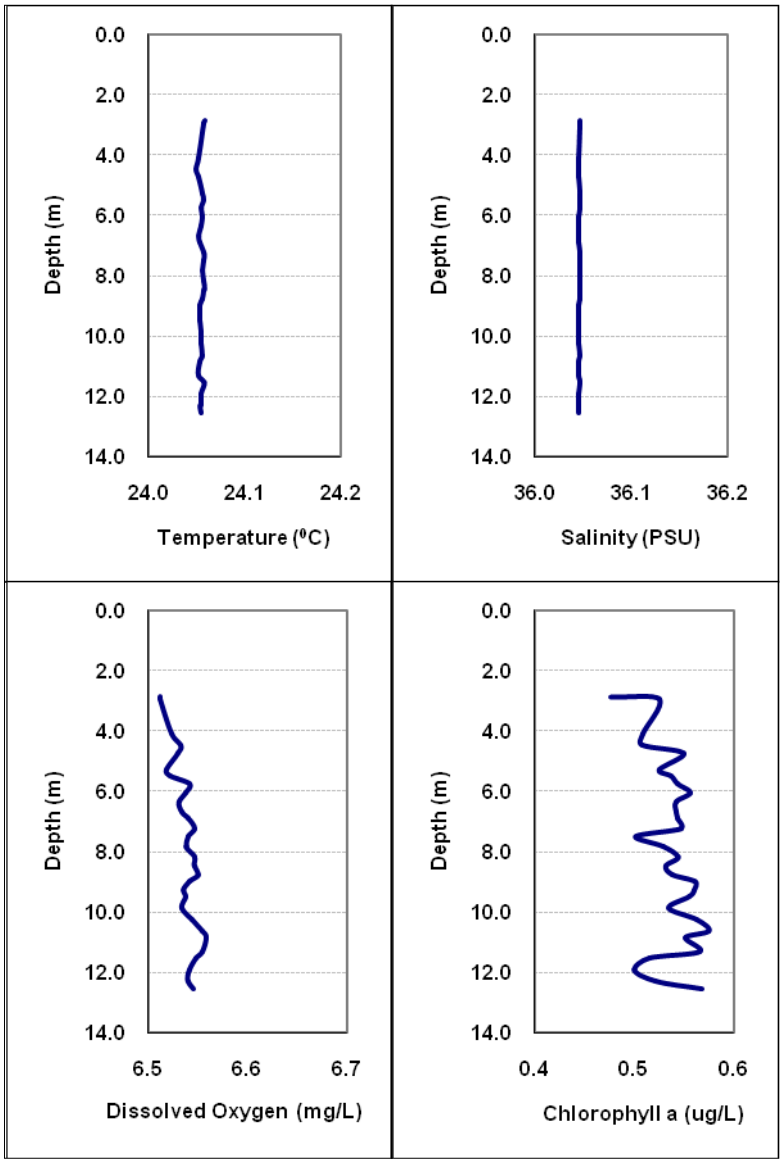

Figure 69: Boynton-Delray water quality monitoring CTD cast at station BD-15 February 2008.

9.5 MAY 2008

Water quality monitoring was conducted on May 19th and 20th, 2008 from the RV Cable. All stations were sampled for all water quality parameters listed in Table 2. Vertical water column profiles were collected using the YSI 6600 sonde. A trip and equipment were collected for the cruise. The times and dates of sample collection are listed in Table 10. The water quality data is listed below in Tables 11-13. Water column profiles can be seen in Figures 82-98.

The tides for May 19th, 2008 were (09:47; 22:28) high and (04:39; 16:44) Low. On May 20th, 2008 the tides were (10:22; 23:05) High and (05:16; 1720) Low. The sea conditions were calm during the morning and early afternoon hours for both days of sampling with winds less than 5knots out of the SSW. Seas increased to 3 feet by 1 pm with winds out of the SSW at 15knots. A total of 4 duplicates were collected for all the water quality parameters sampled. The Boynton inlet station BD-13 was sampled on an outgoing tidal cycle. The boil was not visible at the surface so sampling took place at the appropriate coordinates for the South Central Outfall. The current was in a northerly direction during both sampling days.

NO_3-N+NO_2-N values range from BDL to 0.25µM over the reef and outfall sites, while the Boynton Inlet and LWL had values ranging from BDL to 0.48µM. NH_4-N values ranged from 0.17µM to 1.24µM over the reef and outfall stations, while the values varied from 0.60µM to 0.93µM for the Boynton Inlet and LWL stations. Ortho-PO_4-P values ranged from BDL to 0.26µM over the reef and outfall sites, while values from Boynton Inlet and LWL varied between 0.06µM to 0.17µM. SiO_4-Si values were below detection levels for the reef and outfall stations, while the Boynton Inlet and LWL values varied from 2.0µM to 3.5µM. TDN and TDP values ranged from (0.28µM to 21.28µM) and (0.08µM to 0.56µM) over the reef and outfall, while values ranged from (8.51µM to 10.83µM) and (0.52µM to 0.82µM) for the Boynton Inlet and LWL sites. TDN samples for stations BD-7C and BD-15A were no good. DOC values ranged from 1.28µM to 403.86µM for the reef and outfall sites, while values ranged from 87.82µM to 141.10µM for the Boynton Inlet and LWL sites. DOC samples for stations BD-11C and BD-15A were determined to be no good.

Temperature values ranged from 23.98^{0}C to 26.38^{0}C over the reef and outfall area, while values ranged from 27.94^{0}C to 29.26^{0}C for the Boynton Inlet and LWL. Salinity values ranged from 34.98 to 35.40 salinity units for the reef and outfall sites, while the Boynton Inlet and LWL sites varied from 33.04 to 34.34 salinity units. pH values ranged from 8.05 to 8.16 units over the reef and outfall, while values ranged from 7.82 to 8.03 units for the Boynton Inlet and LWL. Chlorophyll values ranged from 0.224µg/L to 0.512µg/L for the reef and outfall sites, while the Boynton Inlet and LWL sites ranged from 2.51µg/l to 6.86µg/L. TSS values ranged from 0.18mg/L to 0.59mg/L over the reef and outfall, while values varied from 1.24mg/L to 4.46mg/L in the Boynton Inlet and LWL.

Water column profiles were conducted at each station. Turbidity data is not included with the profiles due to the functioning of the turbidity probe. Only small changes were observed in all of the parameters for the water column profiles. The chlorophyll probe seems to produce higher values than the discrete samples.

Table 22: Date and Time of water sample collection for May 2008.

Date	Time (Local)	Station	Latitude	Longitude	Depth (m)
5/19/2008	830	BD-1A	26.42550	-80.04545	0
5/19/2008	830	BD-1B	26.42550	-80.04545	17
5/19/2008	830	BD-1C	26.42550	-80.04545	35
5/19/2008	912	BD-2A	26.44201	-80.04729	0
5/19/2008	912	BD-2B	26.44201	-80.04729	10
5/19/2008	912	BD-2C	26.44201	-80.04729	20
5/19/2008	946	BD-3A	26.45828	-80.04247	0
5/19/2008	946	BD-3B	26.45828	-80.04247	16
5/19/2008	946	BD-3C	26.45828	-80.04247	31
5/19/2008	1015	BD-4A	26.46192	-80.04195	0
5/19/2008	1015	BD-4B	26.46192	-80.04195	14
5/19/2008	1015	BD-4C	26.46192	-80.04195	28
5/19/2008	1059	BD-5A	26.46620	-80.04167	0
5/19/2008	1059	BD-5B	26.46620	-80.04167	13
5/19/2008	1059	BD-5C	26.46620	-80.04167	25
5/19/2008	1124	BD-6A	26.47532	-80.03976	0
5/19/2008	1124	BD-6B	26.47532	-80.03976	13
5/19/2008	1124	BD-6C	26.47532	-80.03976	27
5/19/2008	1159	BD-7A	26.48737	-80.03871	0
5/19/2008	1159	BD-7B	26.48737	-80.03871	9
5/19/2008	1159	BD-7C	26.48737	-80.03871	18
5/19/2008	1223	BD-8A	26.51507	-80.03542	0
5/19/2008	1223	BD-8B	26.51507	-80.03542	8
5/19/2008	1223	BD-8C	26.51507	-80.03542	17
5/19/2008	1252	BD-9A	26.50838	-80.04129	0
5/19/2008	1252	BD-9B	26.50838	-80.04129	5
5/19/2008	1252	BD-9C	26.50838	-80.04129	10
5/19/2008	1322	BD-10A	26.52261	-80.03223	0
5/19/2008	1322	BD-10B	26.52261	-80.03223	8
5/19/2008	1322	BD-10C	26.52261	-80.03223	15
5/20/2008	952	BD-11A	26.53333	-80.03584	0
5/20/2008	952	BD-11B	26.53333	-80.03584	9
5/20/2008	952	BD-11C	26.53333	-80.03584	16
5/20/2008	1050	BD-12A	26.53874	-80.03980	0
5/20/2008	1050	BD-12B	26.53874	-80.03980	5
5/20/2008	1050	BD-12C	26.53874	-80.03980	12
5/19/2008	1354	BD-13A	26.54542	-80.04300	0
5/20/2008	1120	BD-14A	26.54242	-80.03996	0
5/20/2008	1120	BD-14C	26.54242	-80.03996	3
5/20/2008	1147	BD-15A	26.55919	-80.03329	0
5/20/2008	1147	BD-15B	26.55919	-80.03329	6
5/20/2008	1147	BD-15C	26.55919	-80.03329	12
5/19/2008	1425	BD-16A	26.54618	-80.04791	0
5/19/2008	1435	BD-17A	26.54264	-80.04790	0
5/19/2008	1450	BD-18A	26.53950	-80.04951	0

Table 23: May 2008 Boynton-Delray nutrient and DOC values in µM.

Station	Depth (m)	N+N (µM)	NH4 (µM)	P (µM)	Si (µM)	TDN (µM)	TDP (µM)	DOC (µM)
BD-1A	0	BDL	0.77	0.07	BDL	7.70	0.56	77.27
BD-1B	17	BDL	0.40	BDL	BDL	21.28	0.31	76.03
BD-1C	35	BDL	0.61	0.03	BDL	0.28	0.17	60.92
BD-2A	0	BDL	0.55	BDL	BDL	10.48	0.20	50.84
BD-2B	10	BDL	0.47	BDL	BDL	7.97	0.23	151.28
BD-2C	20	BDL	0.46	BDL	BDL	5.99	0.17	54.82
BD-3A	0	BDL	0.49	BDL	BDL	5.49	0.13	45.60
BD-3B	16	0.25	0.38	BDL	BDL	3.73	0.13	48.88
BD-3C	31	BDL	0.30	BDL	BDL	9.19	0.08	50.66
BD-4A	0	0.17	4.58	0.26	BDL	6.85	0.77	53.62
BD-4B	14	BDL	0.51	BDL	BDL	12.99	0.17	62.81
BD-4C	28	BDL	0.52	BDL	BDL	2.39	0.24	60.65
BD-5A	0	BDL	1.24	0.08	BDL	10.82	0.25	102.06
BD-5B	13	0.03	0.92	BDL	BDL	4.23	0.32	53.80
BD-5C	25	BDL	0.36	BDL	BDL	16.60	0.18	52.01
BD-6A	0	BDL	0.75	BDL	BDL	6.21	0.32	82.65
BD-6B	13	BDL	0.33	BDL	BDL	2.33	0.19	43.23
BD-6C	27	BDL	0.30	BDL	BDL	2.99	0.37	46.09
BD-7A	0	BDL	0.34	BDL	BDL	4.87	0.17	68.32
BD-7B	9	BDL	0.49	BDL	BDL	3.71	0.26	53.35
BD-7C	18	BDL	0.49	BDL	BDL	N/A	0.37	30.11
BD-8A	0	BDL	0.40	BDL	BDL	8.92	0.12	37.61
BD-8B	8	BDL	0.40	BDL	BDL	5.27	0.22	16.71
BD-8C	17	BDL	0.28	BDL	BDL	5.45	0.35	20.91
BD-9A	0	BDL	0.35	BDL	BDL	6.08	0.32	45.19
BD-9B	5	BDL	0.52	BDL	BDL	4.12	0.31	30.15
BD-9C	10	BDL	0.38	BDL	BDL	4.72	0.30	38.13
BD-10A	0	BDL	0.64	BDL	BDL	6.95	0.32	43.92
BD-10B	8	BDL	0.24	BDL	BDL	4.87	0.30	30.66
BD-10C	15	BDL	0.17	BDL	BDL	5.08	0.29	51.48
BD-11A	0	0.12	0.51	0.06	BDL	3.84	0.16	403.86
BD-11B	9	BDL	0.43	BDL	BDL	6.15	0.48	46.85
BD-11C	16	0.18	0.46	0.03	BDL	4.48	0.20	N/A
BD-12A	0	BDL	0.44	BDL	BDL	7.75	0.19	49.32
BD-12B	5	BDL	0.42	BDL	BDL	3.82	0.13	39.48
BD-12C	12	0.02	0.36	BDL	BDL	2.82	0.26	4.33
BD-13A	0	0.48	0.60	0.11	2.00	10.83	0.52	112.64
BD-14A	0	0.03	0.31	BDL	BDL	2.81	0.16	1.28
BD-14C	3	0.12	0.48	BDL	BDL	2.66	0.19	17.42
BD-15A	0	BDL	0.52	BDL	BDL	N/A	0.20	N/A
BD-15B	6	0.16	0.49	BDL	BDL	4.11	0.23	68.52
BD-15C	12	BDL	0.46	BDL	BDL	2.73	0.17	2.78
BD-16A	0	0.62	0.93	0.14	2.10	8.51	0.61	87.82
BD-17A	0	BDL	0.66	0.06	3.40	9.19	0.71	125.94
BD-18A	0	0.28	0.64	0.17	3.50	10.12	0.82	141.10

Table 24: May 2008 Boynton-Delray nutrient and DOC values in mg/L.

Station	Depth (m)	N+N (mg/L)	NH4 (mg/L)	P (mg/L)	Si (mg/L)	TDN (mg/L)	TDP (mg/L)	DOC (mg/L)
BD-1A	0	BDL	0.011	0.002	BDL	0.10	0.017	1.16
BD-1B	17	BDL	0.006	BDL	BDL	0.26	0.010	1.14
BD-1C	35	BDL	0.009	0.001	BDL	0.00	0.005	0.94
BD-2A	0	BDL	0.008	BDL	BDL	0.13	0.006	0.80
BD-2B	10	BDL	0.007	BDL	BDL	0.10	0.007	2.18
BD-2C	20	BDL	0.006	BDL	BDL	0.07	0.005	0.85
BD-3A	0	BDL	0.007	BDL	BDL	0.07	0.004	0.73
BD-3B	16	0.004	0.005	BDL	BDL	0.05	0.004	0.77
BD-3C	31	BDL	0.004	BDL	BDL	0.11	0.003	0.80
BD-4A	0	0.002	0.064	0.008	BDL	0.09	0.024	0.84
BD-4B	14	BDL	0.007	BDL	BDL	0.16	0.005	0.96
BD-4C	28	BDL	0.007	BDL	BDL	0.03	0.007	0.93
BD-5A	0	BDL	0.017	0.002	BDL	0.13	0.008	1.50
BD-5B	13	BDL	0.013	BDL	BDL	0.05	0.010	0.84
BD-5C	25	BDL	0.005	BDL	BDL	0.21	0.006	0.81
BD-6A	0	BDL	0.010	BDL	BDL	0.08	0.010	1.24
BD-6B	13	BDL	0.005	BDL	BDL	0.03	0.006	0.69
BD-6C	27	BDL	0.004	BDL	BDL	0.04	0.012	0.73
BD-7A	0	BDL	0.005	BDL	BDL	0.06	0.005	1.04
BD-7B	9	BDL	0.007	BDL	BDL	0.04	0.008	1.08
BD-7C	18	BDL	0.007	BDL	BDL	N/A	0.012	0.84
BD-8A	0	BDL	0.006	BDL	BDL	0.11	0.004	0.92
BD-8B	8	BDL	0.006	BDL	BDL	0.06	0.007	0.70
BD-8C	17	BDL	0.004	BDL	BDL	0.06	0.011	0.75
BD-9A	0	BDL	0.005	BDL	BDL	0.07	0.010	0.99
BD-9B	5	BDL	0.007	BDL	BDL	0.05	0.010	0.84
BD-9C	10	BDL	0.005	BDL	BDL	0.06	0.009	0.92
BD-10A	0	BDL	0.009	BDL	BDL	0.08	0.010	0.98
BD-10B	8	BDL	0.003	BDL	BDL	0.06	0.009	0.85
BD-10C	15	BDL	0.005	BDL	BDL	0.06	0.009	1.06
BD-11A	0	0.002	0.007	0.002	BDL	0.05	0.005	4.64
BD-11B	9	BDL	0.006	BDL	BDL	0.07	0.015	1.01
BD-11C	16	0.003	0.006	0.001	BDL	0.05	0.006	N/A
BD-12A	0	BDL	0.006	BDL	BDL	0.09	0.006	1.04
BD-12B	5	BDL	0.006	BDL	BDL	0.05	0.004	0.94
BD-12C	12	BDL	0.005	BDL	BDL	0.03	0.008	0.58
BD-13A	0	0.007	0.008	0.003	0.056	0.13	0.016	1.68
BD-14A	0	BDL	0.004	BDL	BDL	0.03	0.005	0.55
BD-14C	3	0.002	0.007	BDL	BDL	0.03	0.006	0.71
BD-15A	0	BDL	0.007	BDL	BDL	N/A	0.006	N/A
BD-15B	6	0.002	0.007	BDL	BDL	0.05	0.007	1.23
BD-15C	12	BDL	0.006	BDL	BDL	0.03	0.005	0.56
BD-16A	0	0.009	0.013	0.004	0.059	0.10	0.019	1.43
BD-17A	0	BDL	0.009	0.002	0.095	0.11	0.022	1.81
BD-18A	0	0.004	0.009	0.005	0.098	0.12	0.025	1.97

Table 25: May 2008 Boynton-Delray pH. TSS, Chlorophyll.

Station	Depth (m)	Temperature (^{0}C)	Salinity (Units)	pH (Units)	Chlorophyll a (µg/L)	Phaeopigments (µg/L)	TSS (mg/L)
BD-1A	0	26.2	35.21	8.12	0.276	0.081	0.320
BD-1B	17	25.7	35.35	8.11	0.377	0.135	0.260
BD-1C	35	24.0	35.17	8.11	0.418	0.213	0.180
BD-2A	0	26.2	35.21	8.05	0.345	0.114	0.210
BD-2B	10	26.1	35.24	8.13	0.349	0.107	0.220
BD-2C	20	25.8	34.98	8.12	0.318	0.112	0.220
BD-3A	0	26.3	35.25	8.10	0.297	0.095	0.350
BD-3B	16	26.0	35.32	8.12	0.258	0.096	0.200
BD-3C	31	25.1	35.02	8.14	0.369	0.156	0.190
BD-4A	0	26.3	35.27	8.10	0.318	0.098	0.250
BD-4B	14	26.1	35.31	8.14	0.294	0.098	0.220
BD-4C	28	25.5	35.10	8.16	0.411	0.014	0.460
BD-5A	0	26.2	35.20	8.10	0.311	0.105	0.480
BD-5B	13	26.0	35.32	8.09	0.325	0.113	0.510
BD-5C	25	25.7	35.20	8.11	0.399	0.130	0.470
BD-6A	0	26.4	35.29	8.11	0.293	0.099	0.590
BD-6B	13	26.0	35.33	8.14	0.336	0.116	0.560
BD-6C	27	25.5	35.22	8.13	0.379	15.000	0.260
BD-7A	0	26.4	35.30	8.12	0.330	0.075	0.270
BD-7B	9	26.1	35.32	8.12	0.269	0.116	0.280
BD-7C	18	26.0	35.26	8.10	0.318	0.120	0.260
BD-8A	0	26.2	35.32	8.10	0.321	0.095	0.500
BD-8B	8	26.1	35.33	8.10	0.332	0.117	0.270
BD-8C	17	25.9	35.27	8.12	0.376	0.109	0.260
BD-9A	0	26.1	35.32	8.12	0.230	0.075	0.230
BD-9B	5	26.1	35.32	8.16	0.224	0.078	0.250
BD-9C	10	26.1	35.31	8.18	0.241	0.080	0.270
BD-10A	0	26.4	35.34	8.11	0.277	0.081	0.270
BD-10B	8	26.0	35.35	8.16	0.308	0.094	N/A
BD-10C	15	25.9	35.33	8.15	0.376	0.115	N/A
BD-11A	0	26.0	35.32	8.06	0.272	0.098	N/A
BD-11B	9	25.7	35.34	8.08	0.325	0.121	N/A
BD-11C	16	25.6	35.29	8.10	0.342	0.122	N/A
BD-12A	0	26.1	35.36	8.03	0.255	0.091	0.290
BD-12B	5	25.8	35.40	8.04	0.289	0.104	0.310
BD-12C	12	25.7	35.34	8.07	0.329	0.117	0.300
BD-13A	0	27.9	34.34	8.03	2.685	0.816	1.930
BD-14A	0	26.2	35.31	8.08	0.512	0.157	0.420
BD-14C	3	26.0	35.34	8.10	0.460	0.146	0.390
BD-15A	0	26.1	35.40	8.08	0.394	0.134	0.470
BD-15B	6	25.8	35.38	8.09	0.333	0.111	0.310
BD-15C	12	25.8	35.36	8.11	0.325	0.115	0.310
BD-16A	0	28.0	34.01	7.96	2.508	0.876	2.570
BD-17A	0	29.3	33.04	7.77	6.859	1.070	1.240
BD-18A	0	29.0	33.52	7.82	4.552	1.847	4.460

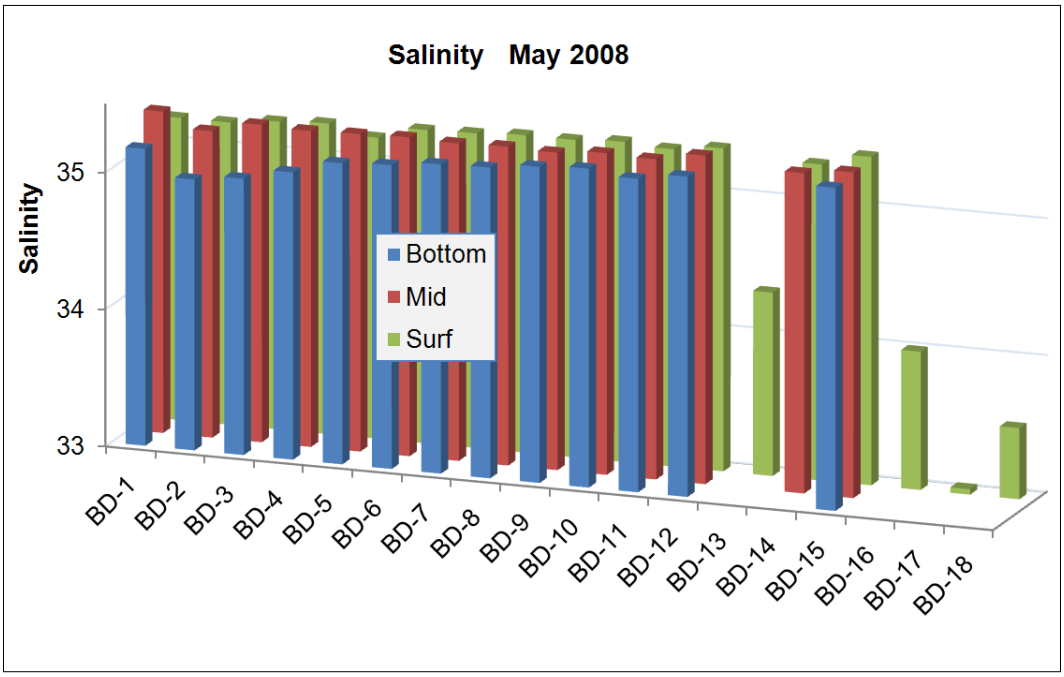

Figure 70: May 2008 salinity values for the Boynton-Delray water quality monitoring stations.

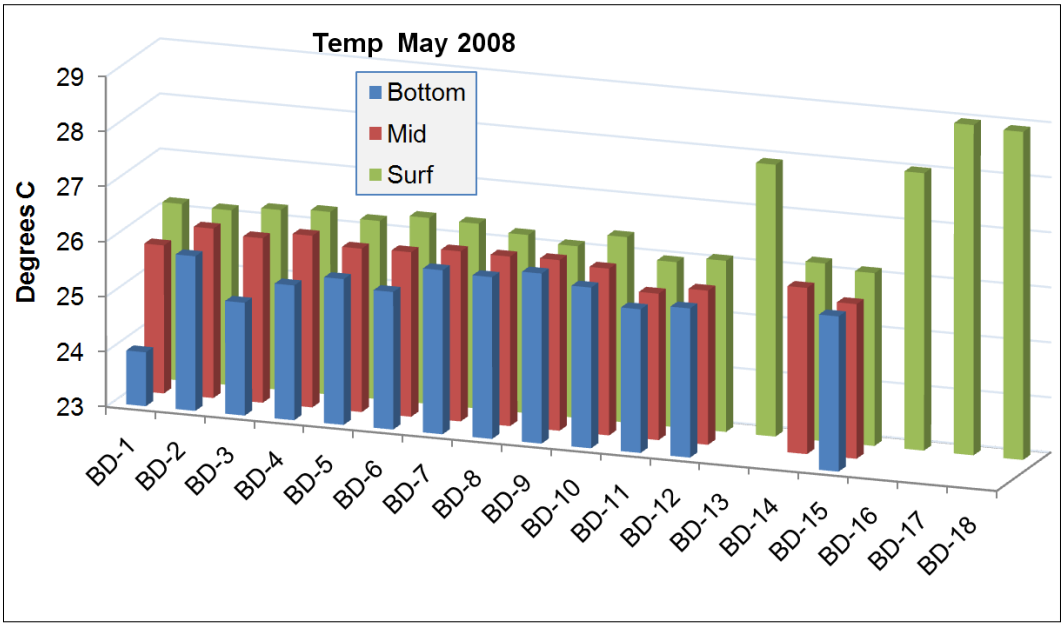

Figure 71: May 2008 temperature values for the Boynton-Delray water quality monitoring stations.

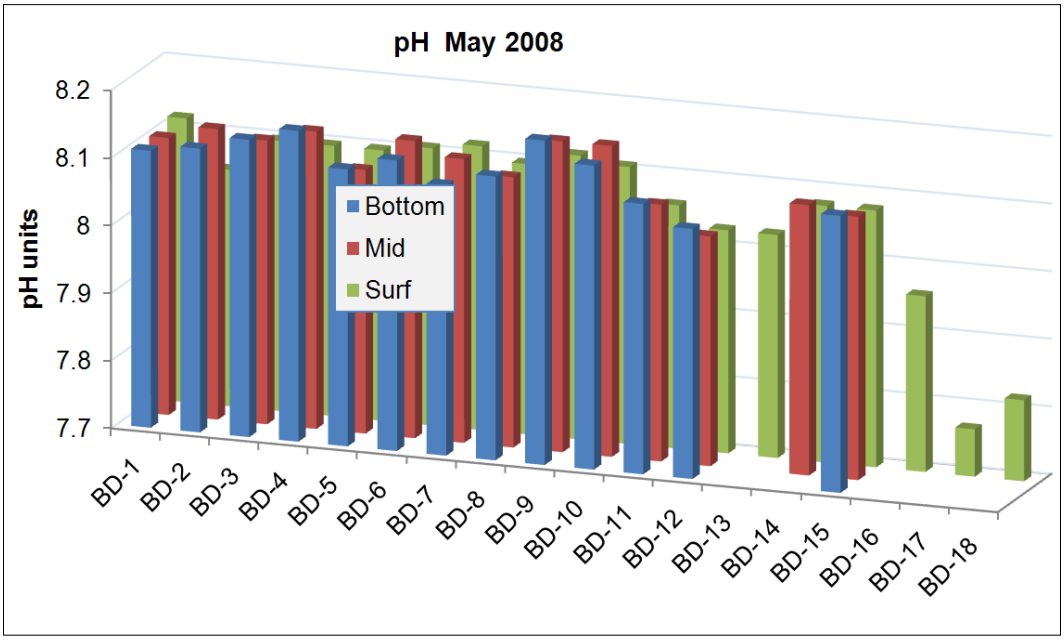

Figure 72: May 2008 pH results for the Boynton-Delray water quality monitoring stations.

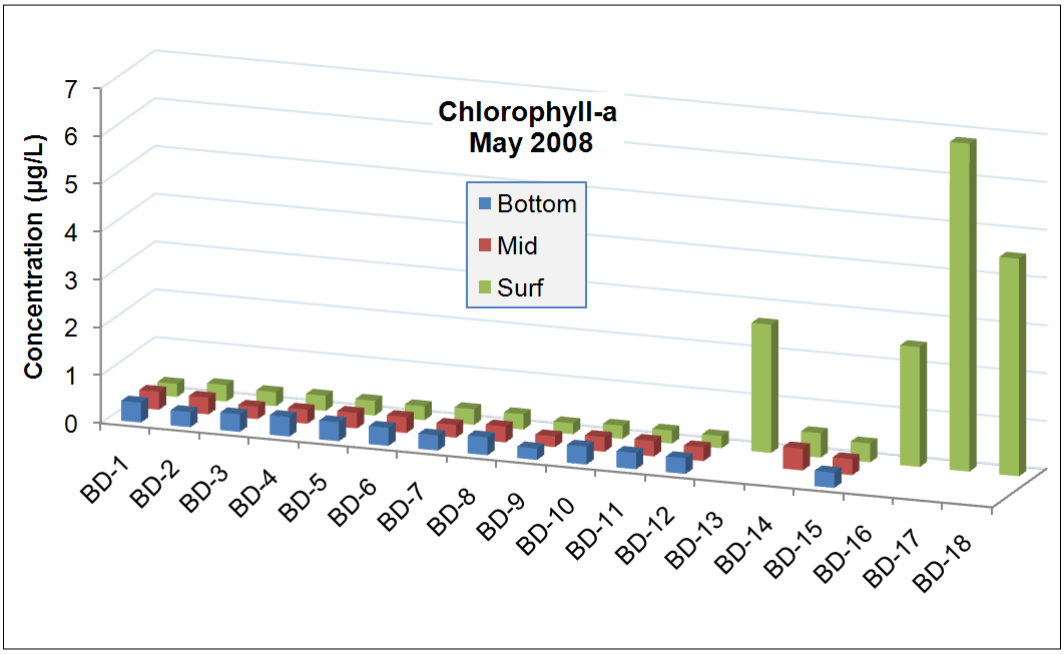

Figure 73: May 2008 chlorophyll concentrations for the Boynton-Delray water quality monitoring stations.

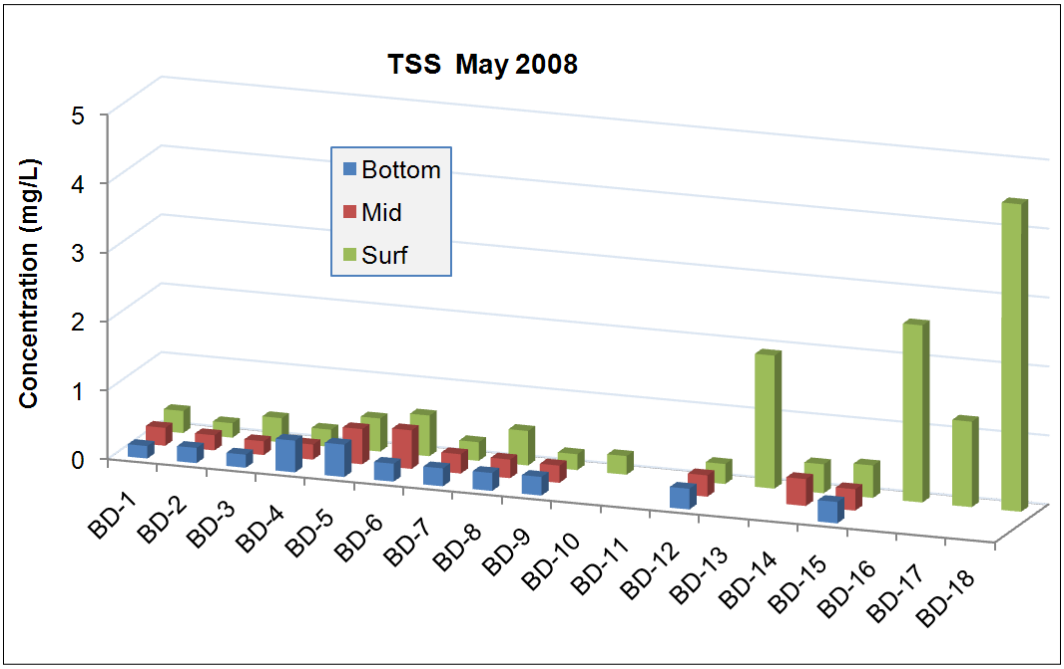

Figure 74: May 2008 TSS concentrations for the Boynton-Delray water quality monitoring stations.

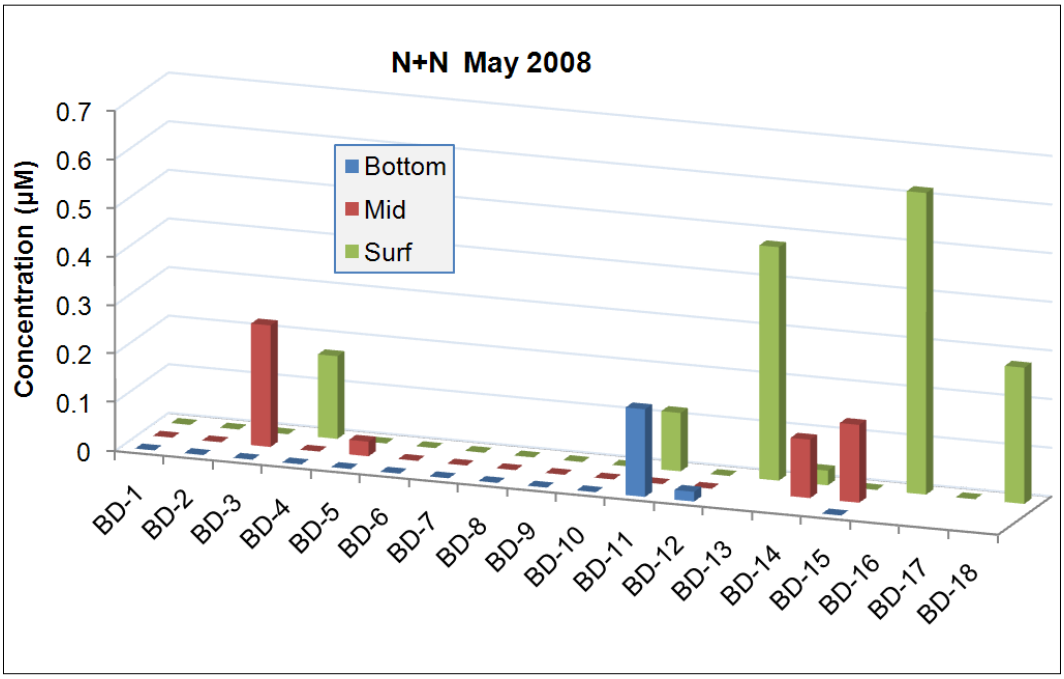

Figure 75: May 2008 N+N concentrations for the Boynton-Delray water quality monitoring stations.

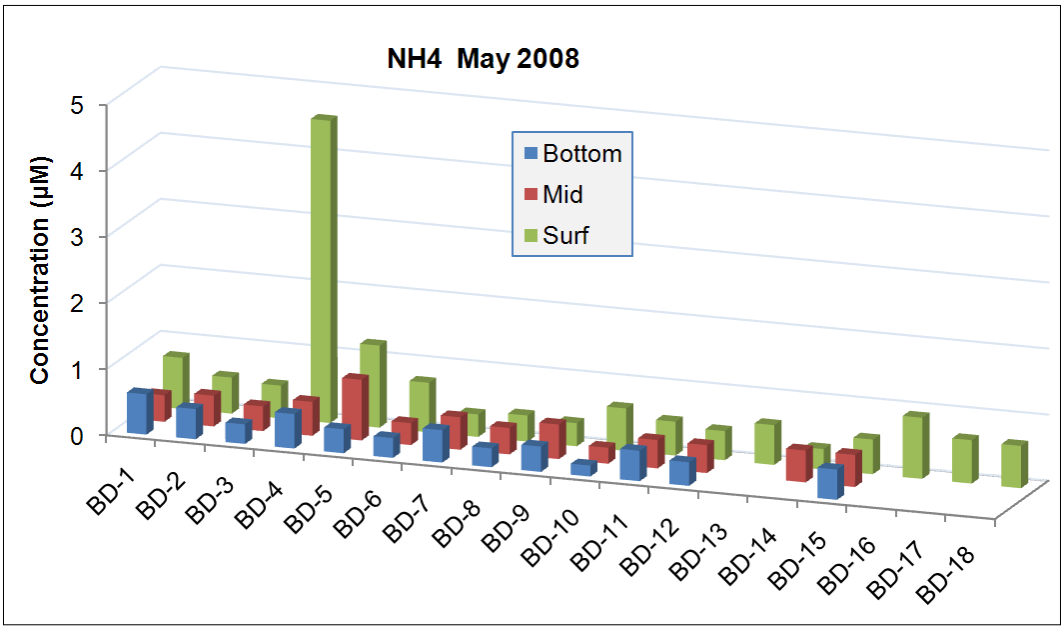

Figure 76: May 2008 NH4 concentrations for the Boynton-Delray water quality monitoring stations.

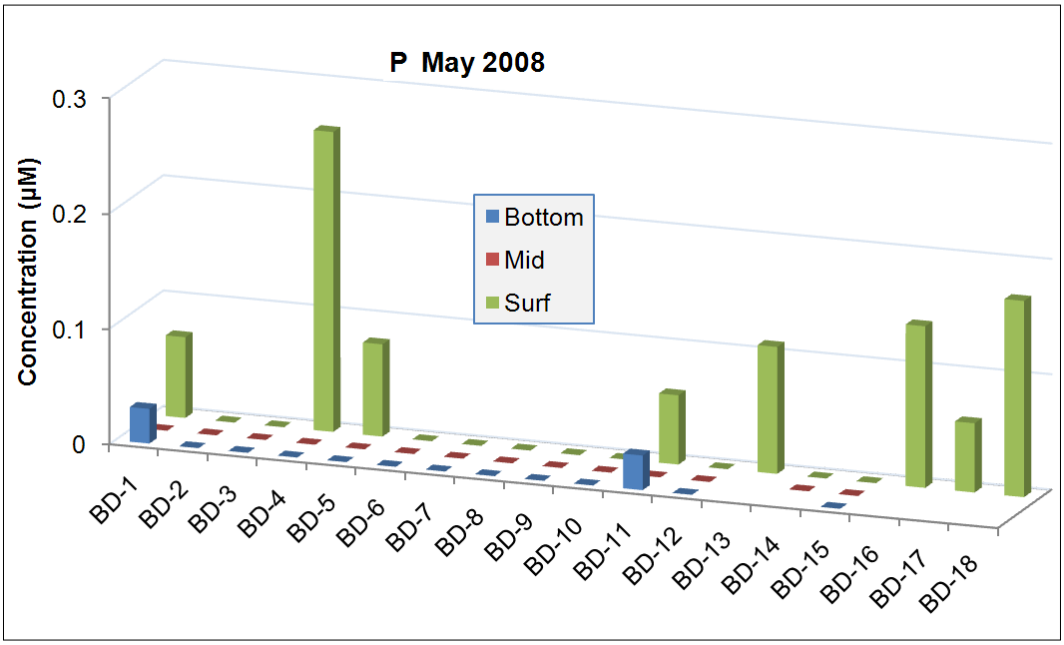

Figure 77: May 2008 P concentrations for the Boynton-Delray water quality monitoring stations.

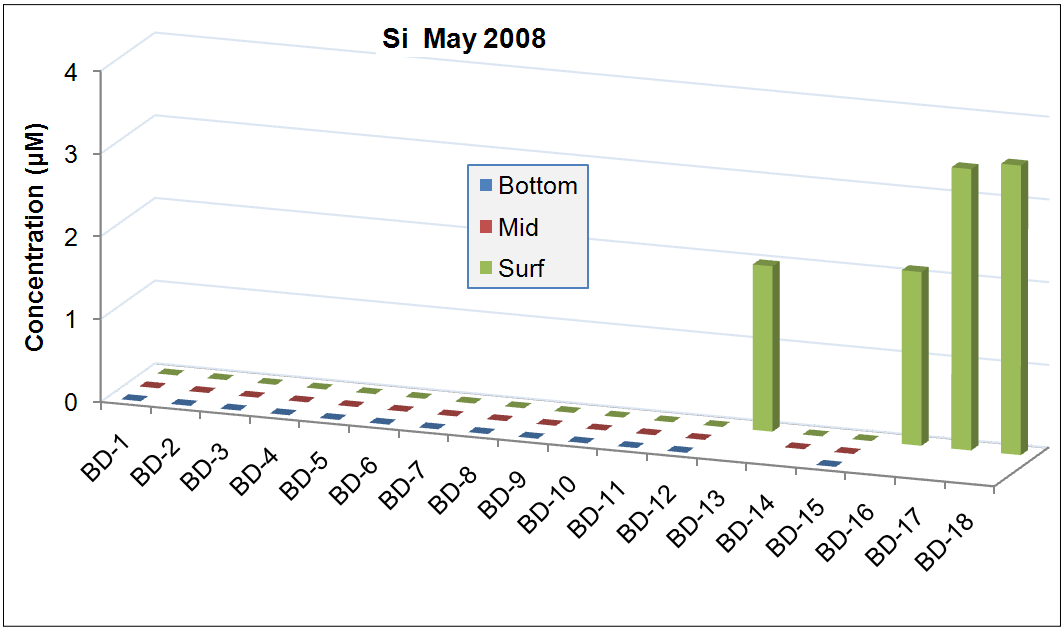

Figure 78: May 2008 Si concentrations for the Boynton-Delray water quality monitoring stations.

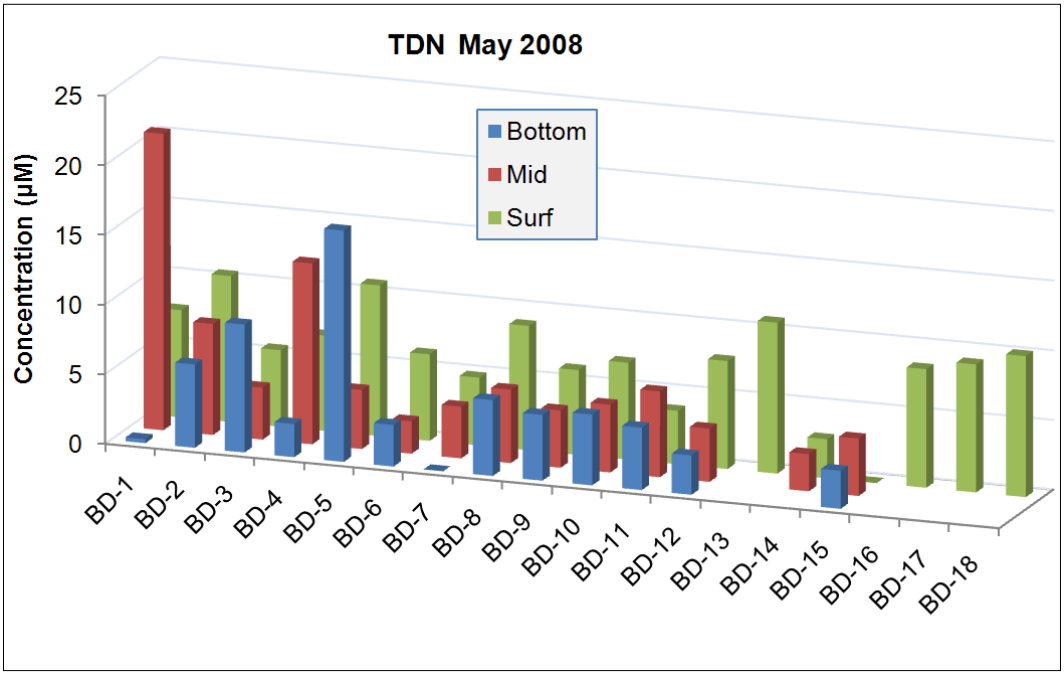

Figure 79: May 2008 TDN concentrations for the Boynton-Delray water quality monitoring stations.

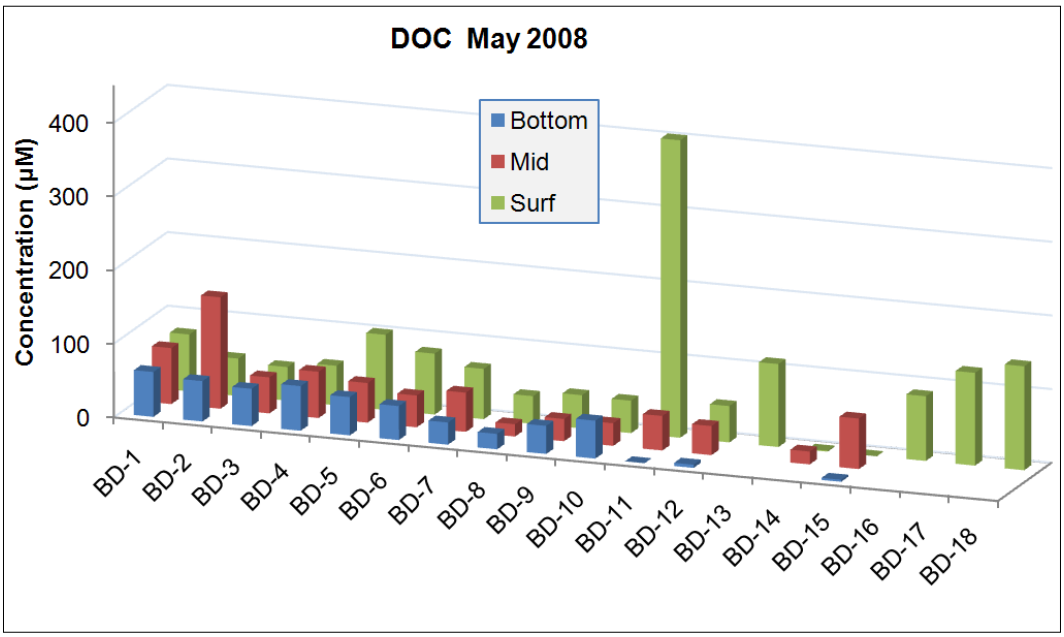

Figure 80: May 2008 DOC concentrations for the Boynton-Delray water quality monitoring stations.

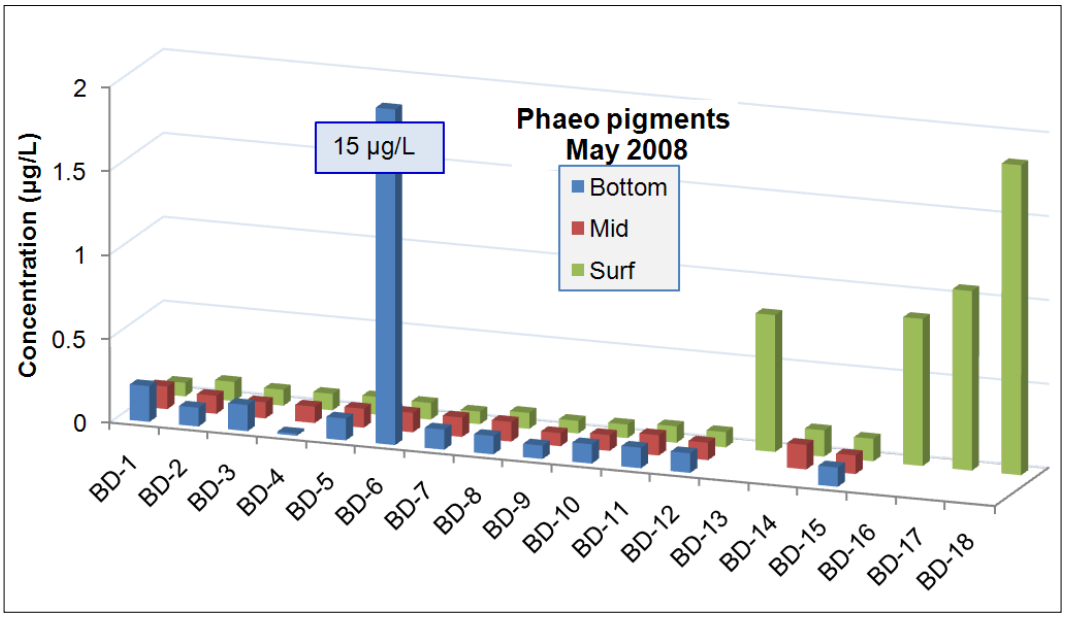

Figure 81: May 2008 phaeopigment concentrations for the Boynton-Delray water quality monitoring stations.

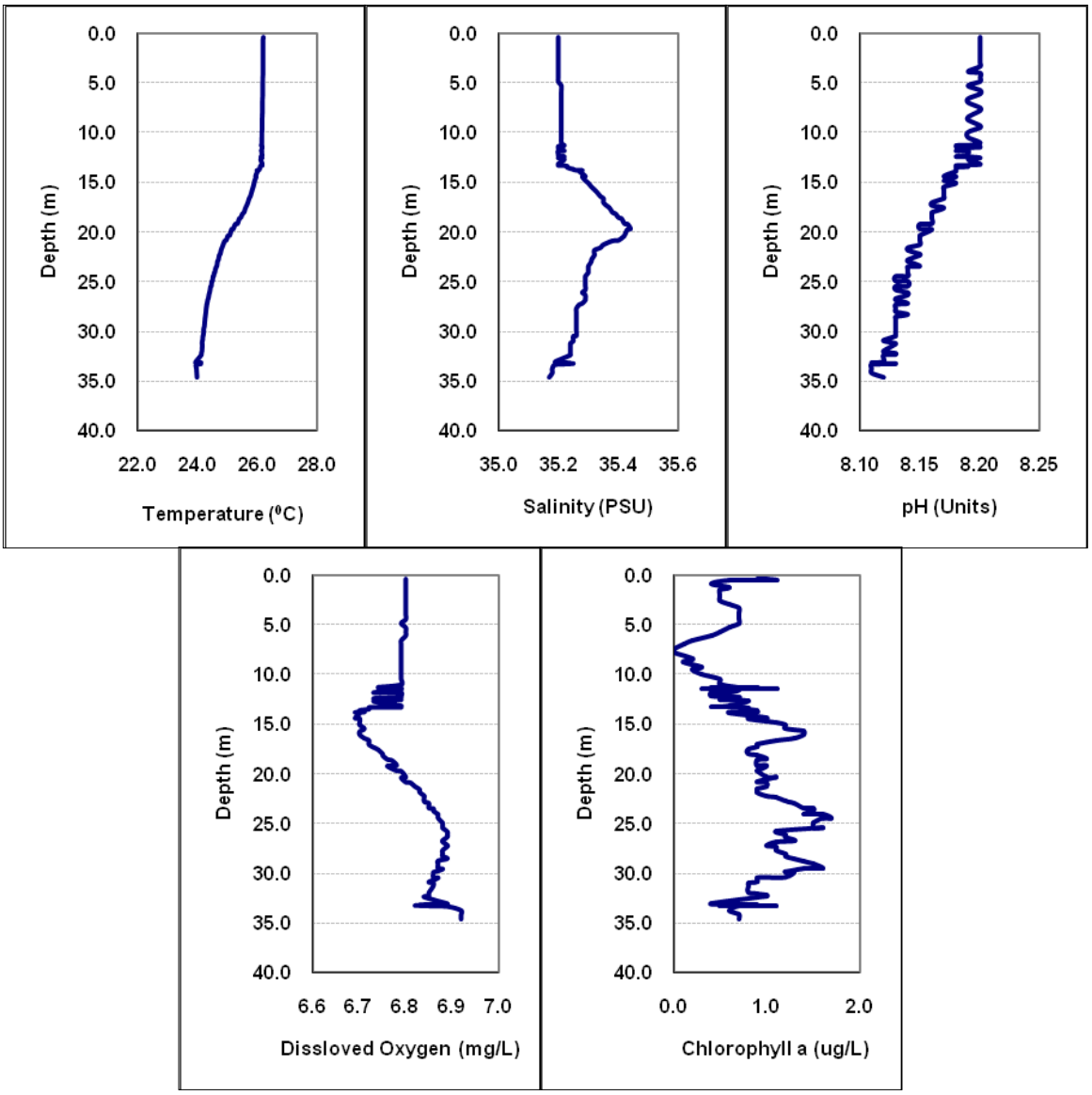

Figure 82: Boynton-Delray water quality monitoring YSI cast at station BD-1 May 2008.

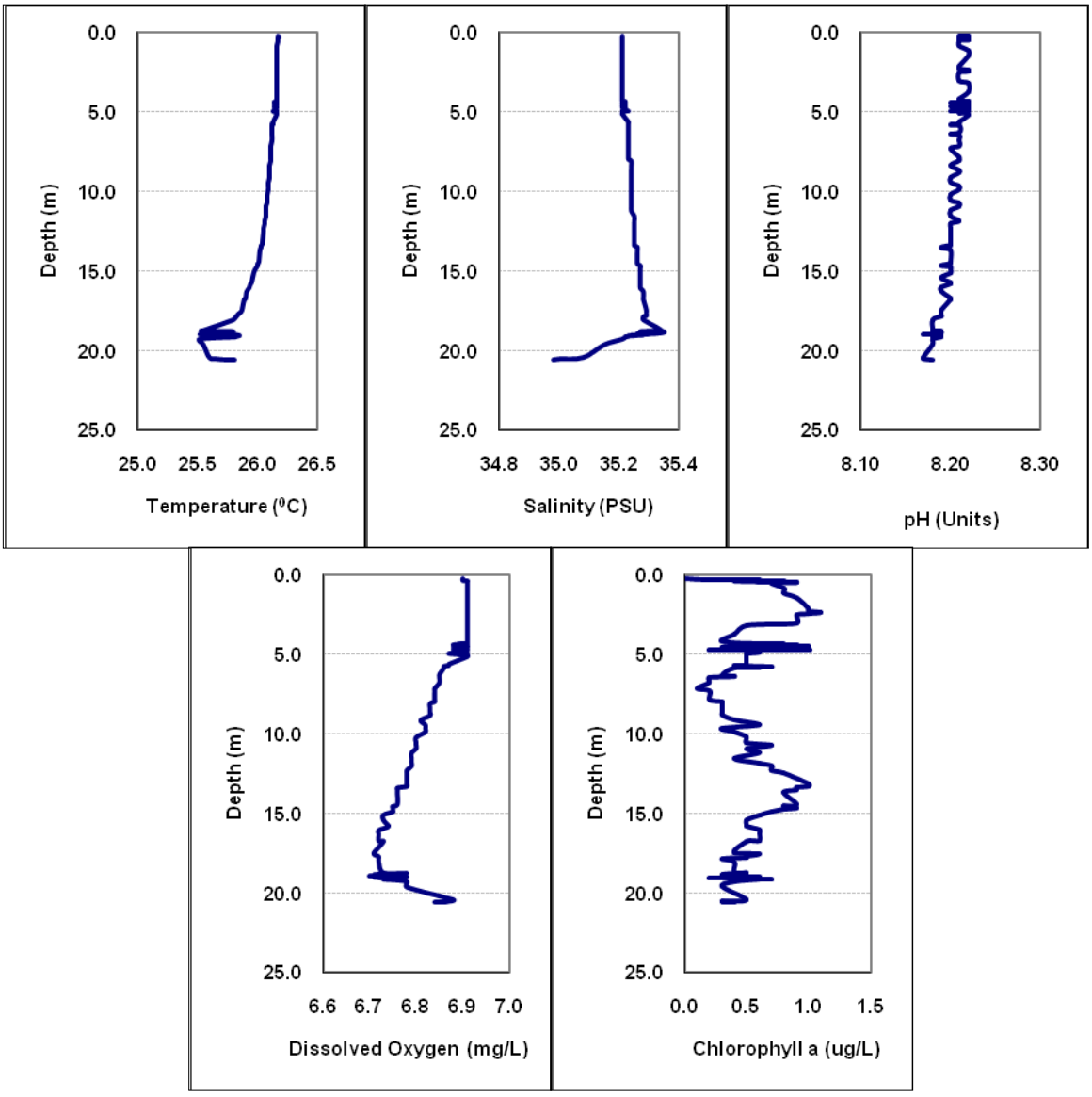

Figure 83: Boynton-Delray water quality monitoring YSI cast at station BD-2 May 2008.

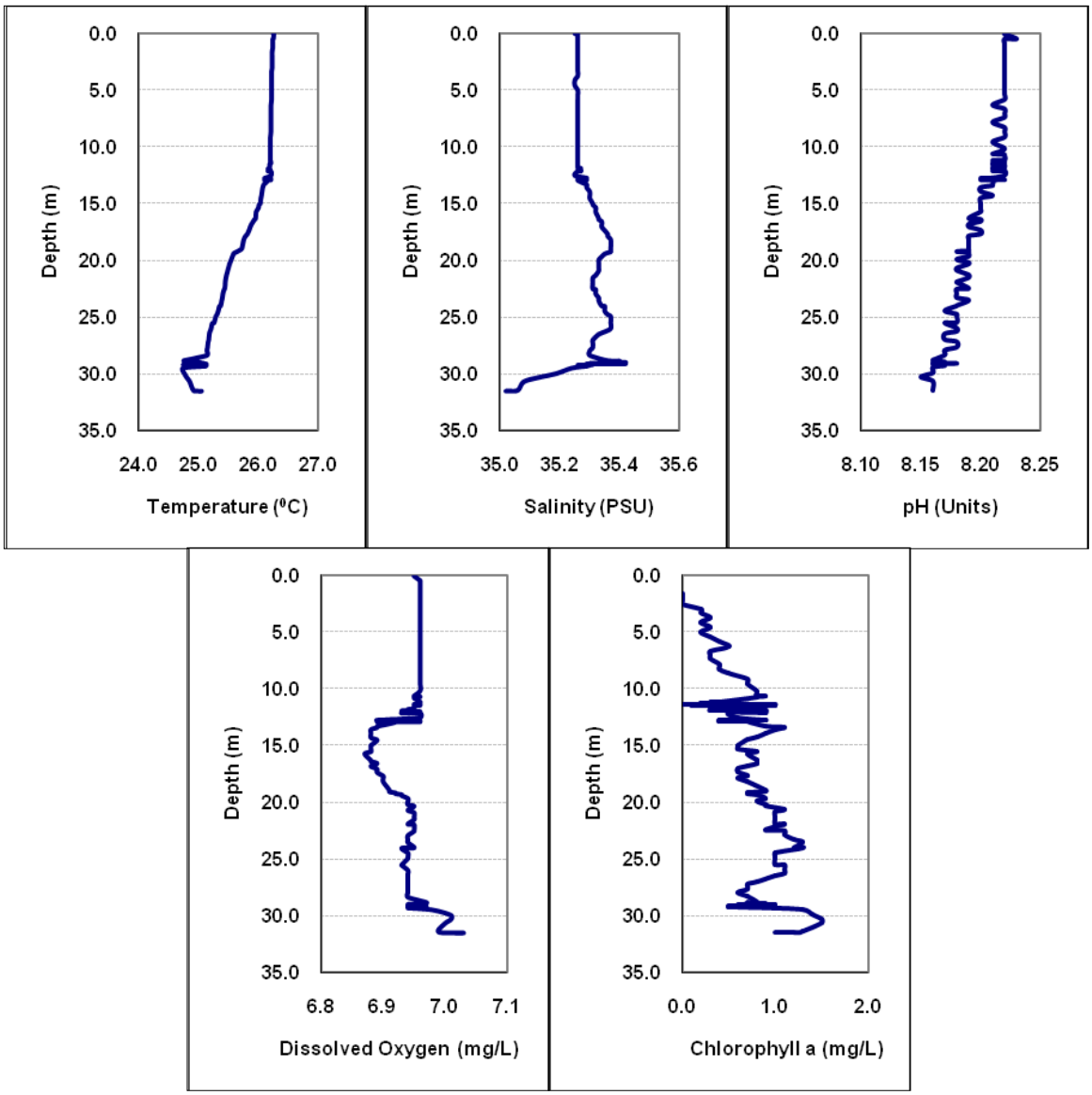

Figure 84: Boynton-Delray water quality monitoring YSI cast at station BD-3 May 2008.

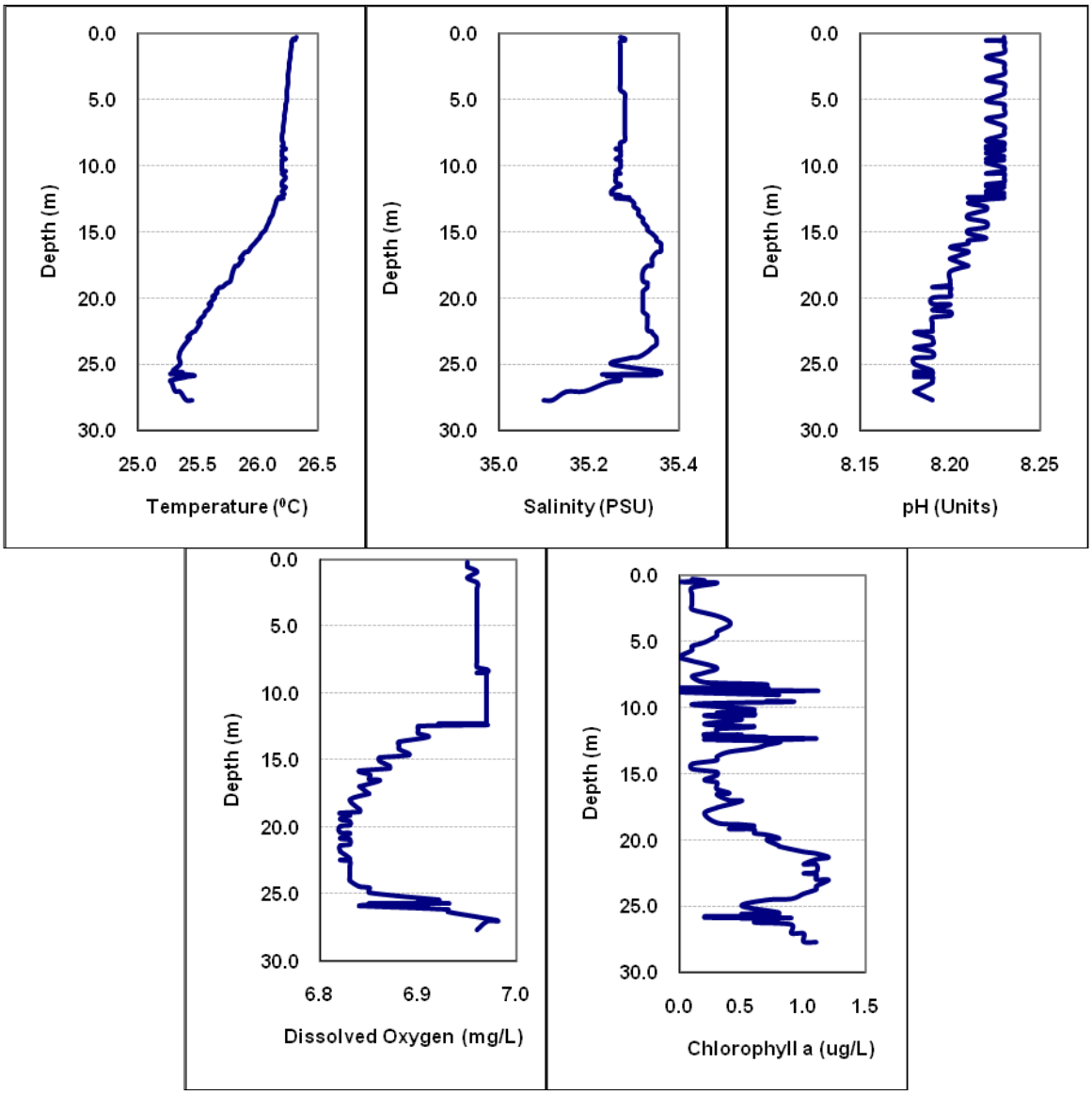

Figure 85: Boynton-Delray water quality monitoring YSI cast at station BD-4 May 2008.

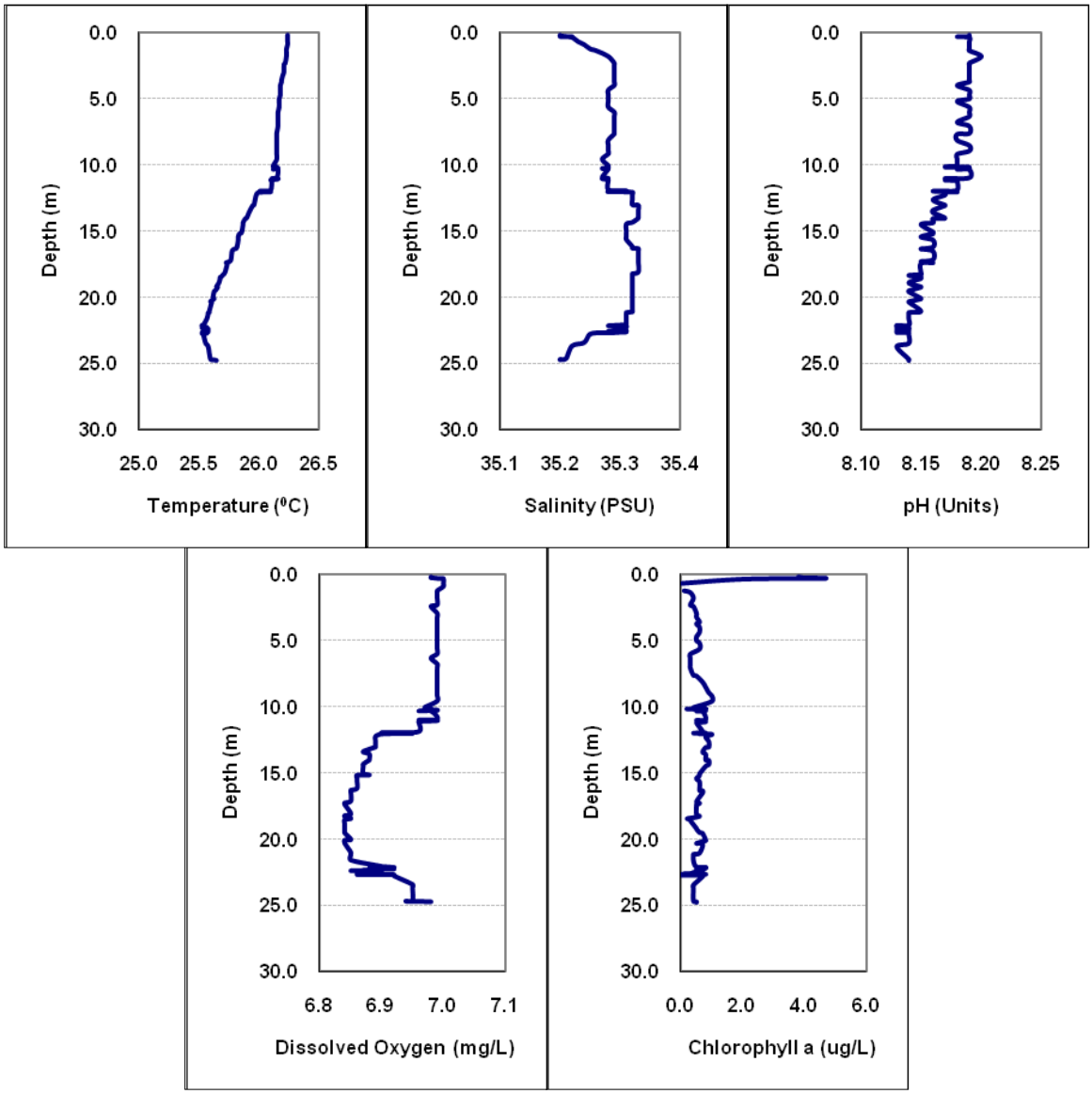

Figure 86: Boynton-Delray water quality monitoring YSI cast at station BD-5 May 2008.

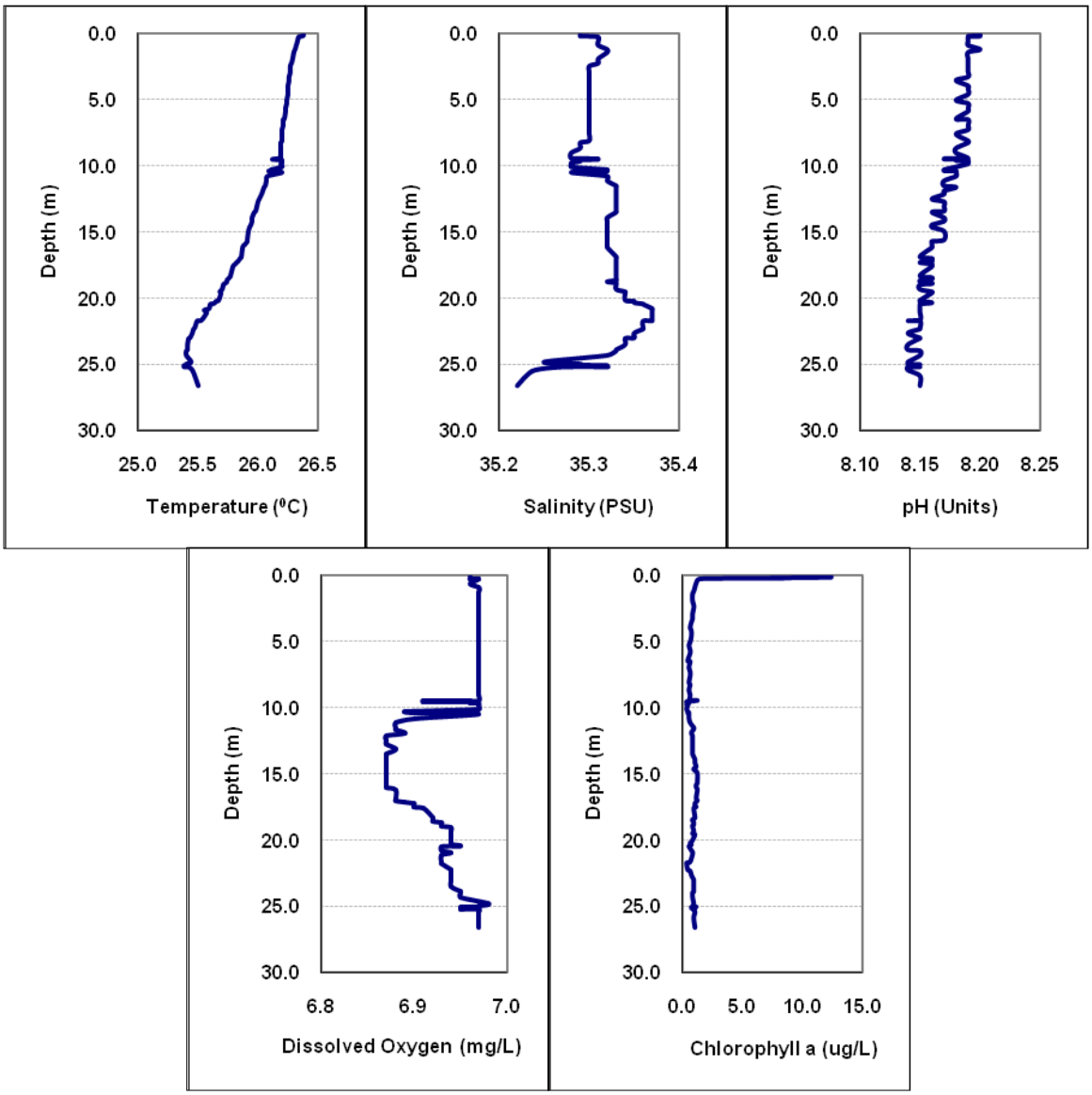

Figure 87: Boynton-Delray water quality monitoring YSI cast at station BD-6 May 2008.

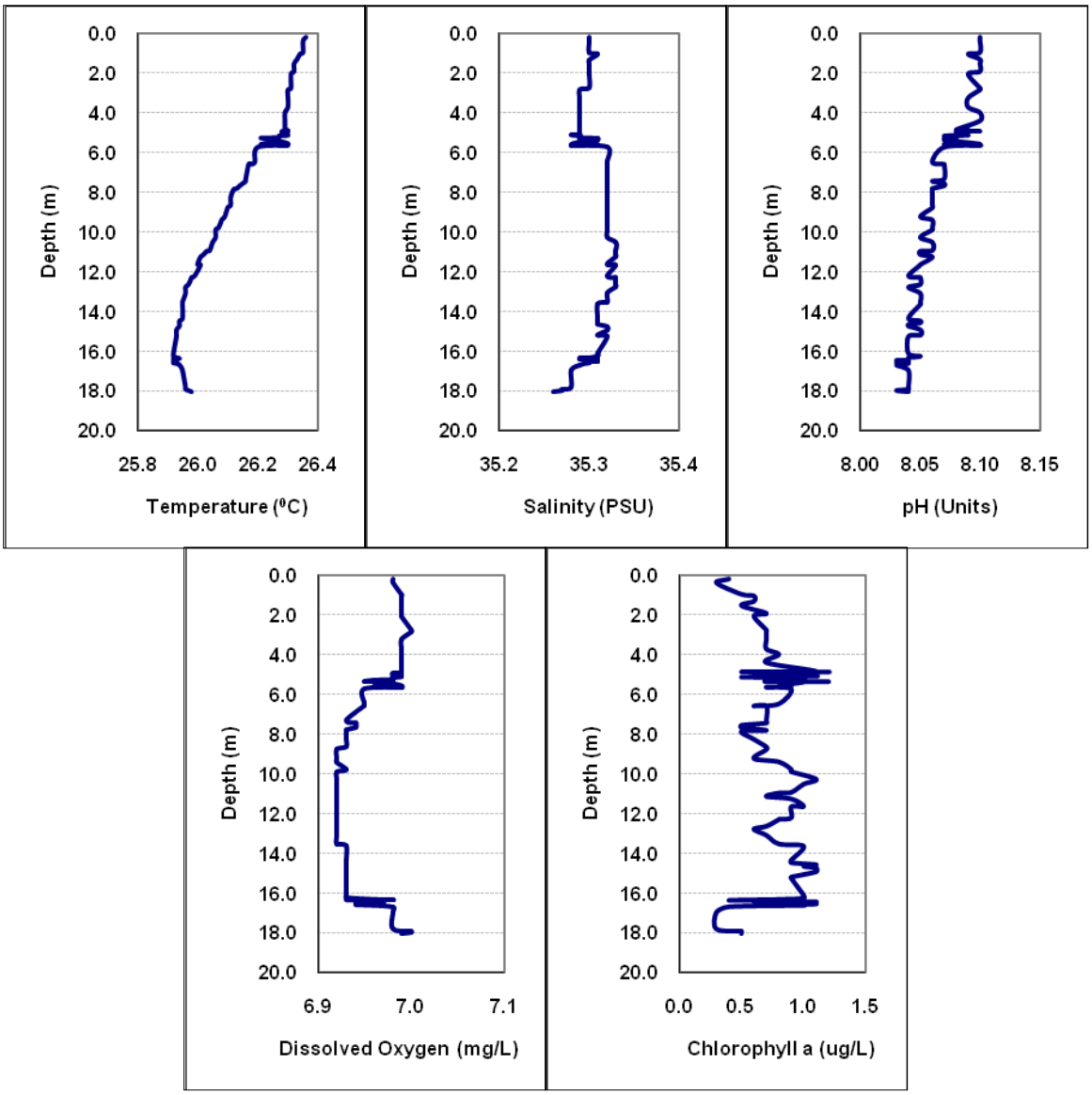

Figure 88: Boynton-Delray water quality monitoring YSI cast at station BD-7 May 2008.

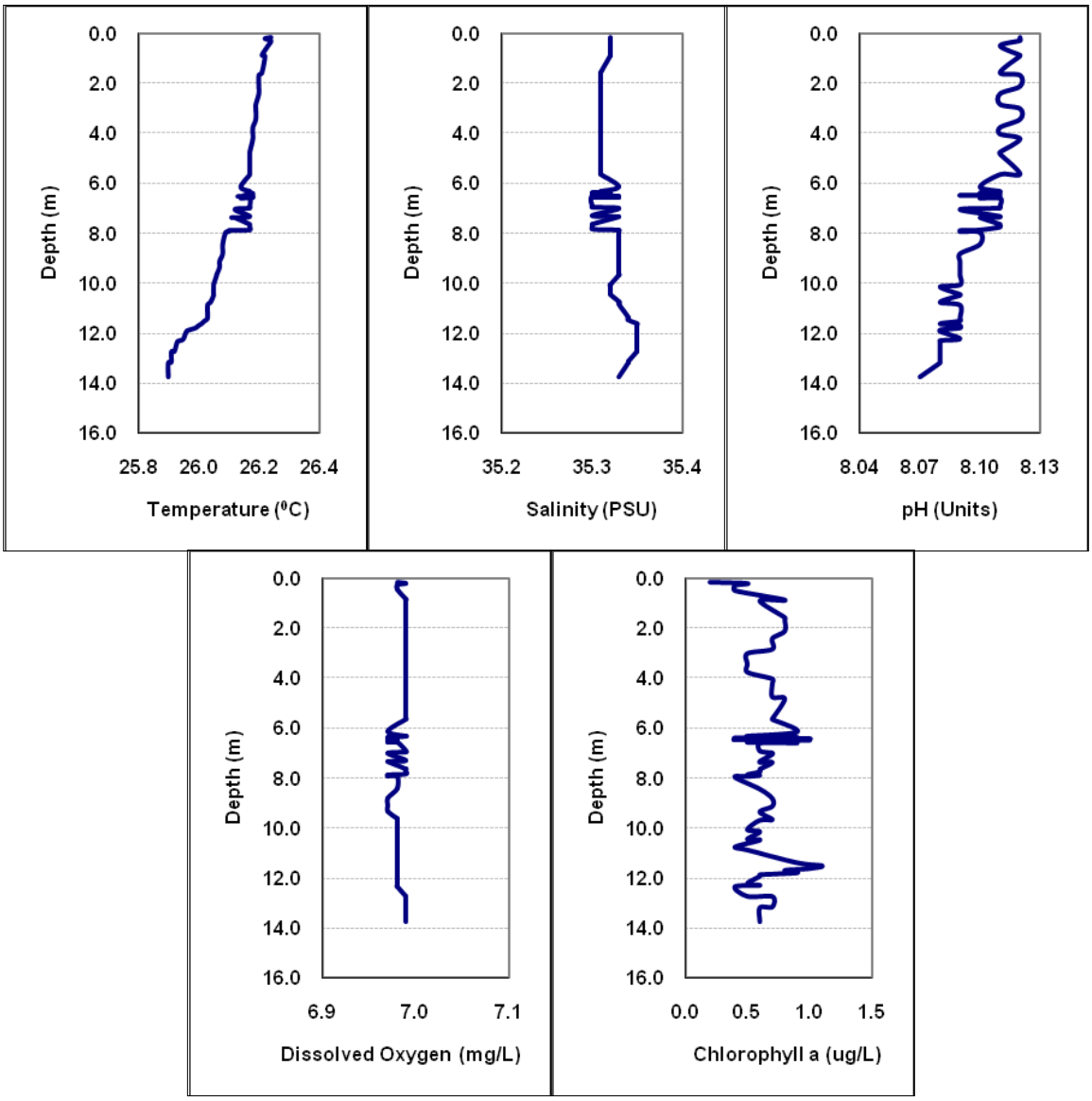

Figure 89: Boynton-Delray water quality monitoring YSI cast at station BD-8 May 2008.

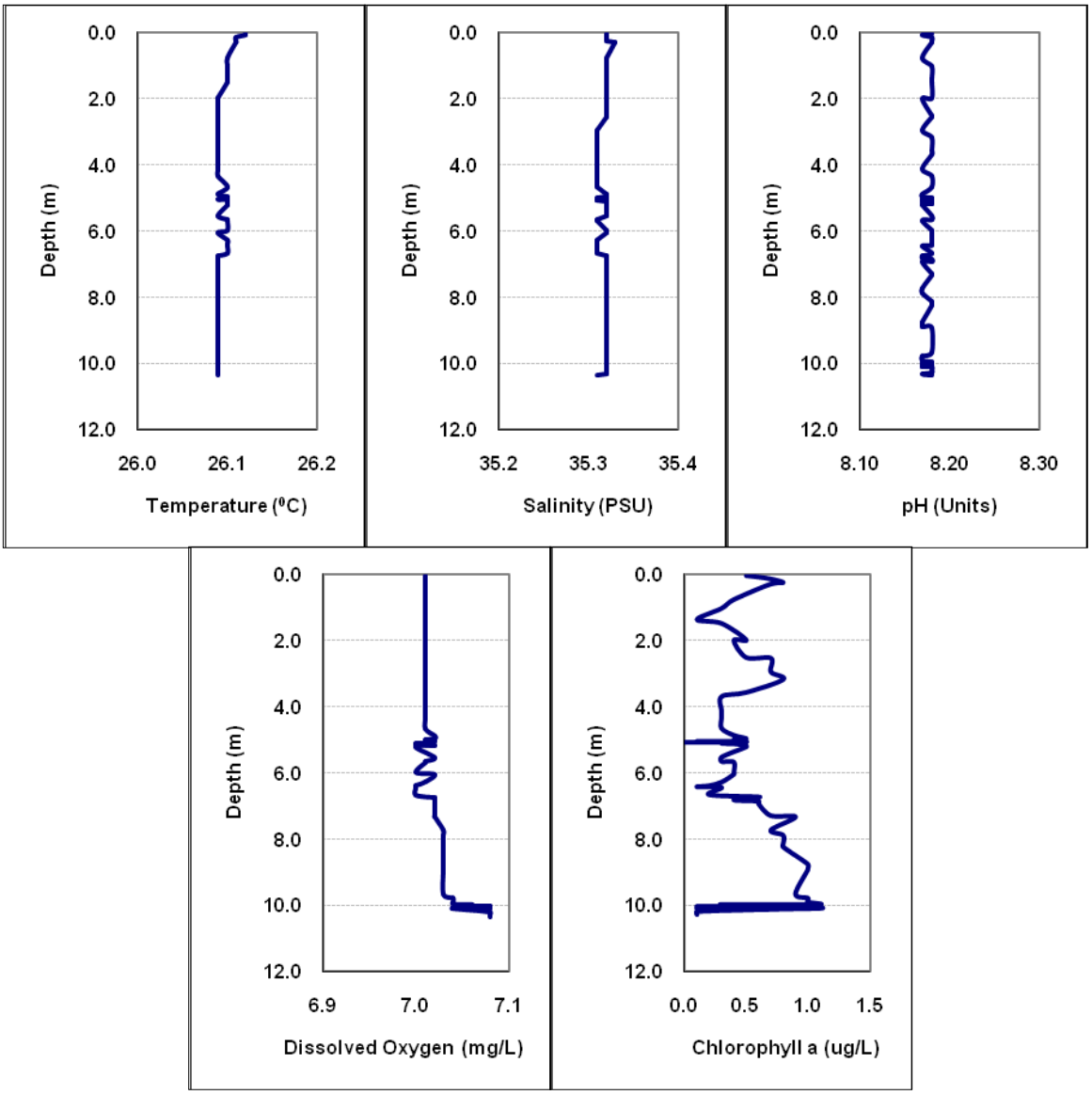

Figure 90: Boynton-Delray water quality monitoring YSI cast at station BD-9 May 2008.

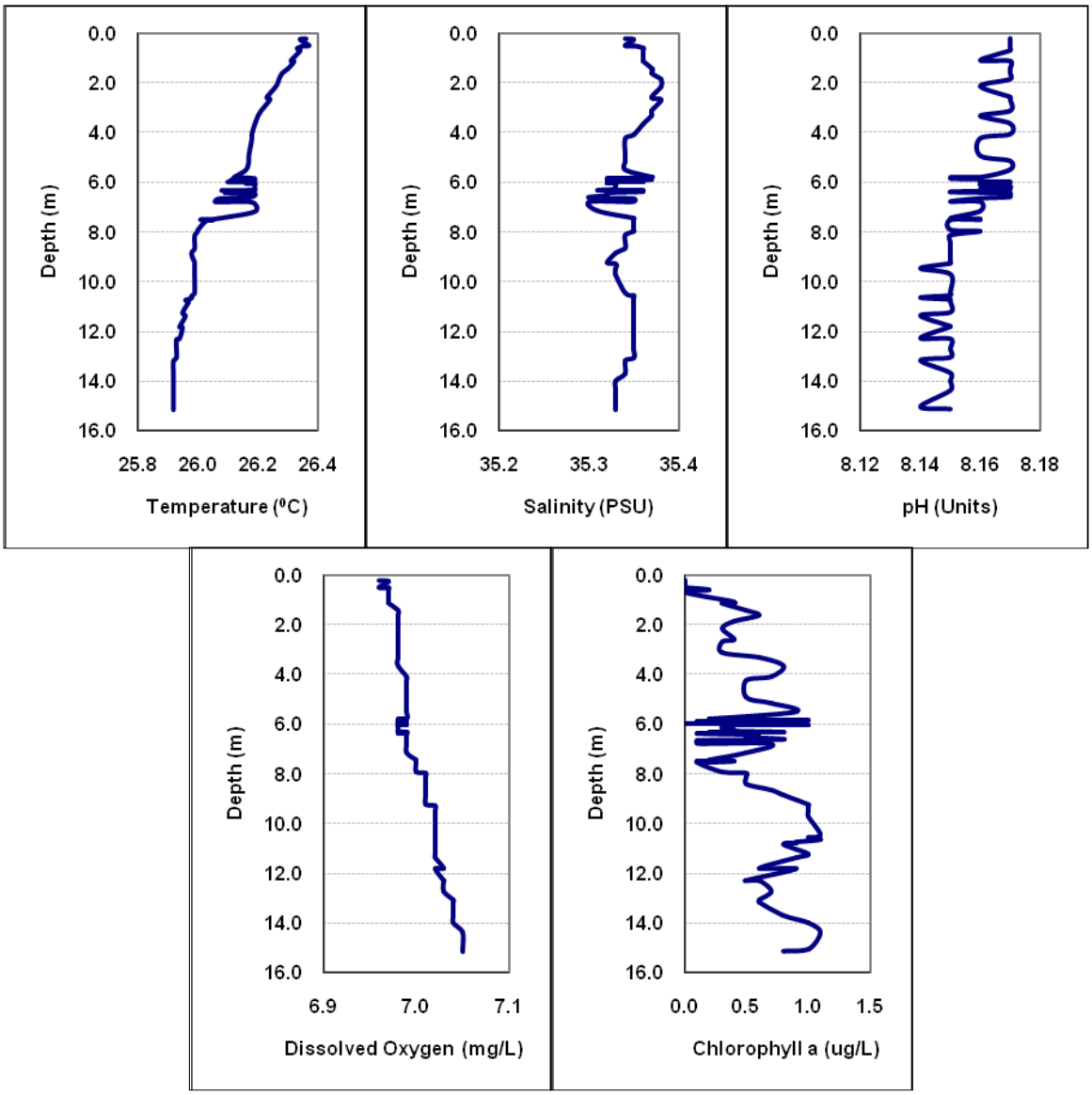

Figure 91: Boynton-Delray water quality monitoring YSI cast at station BD-10 May 2008.

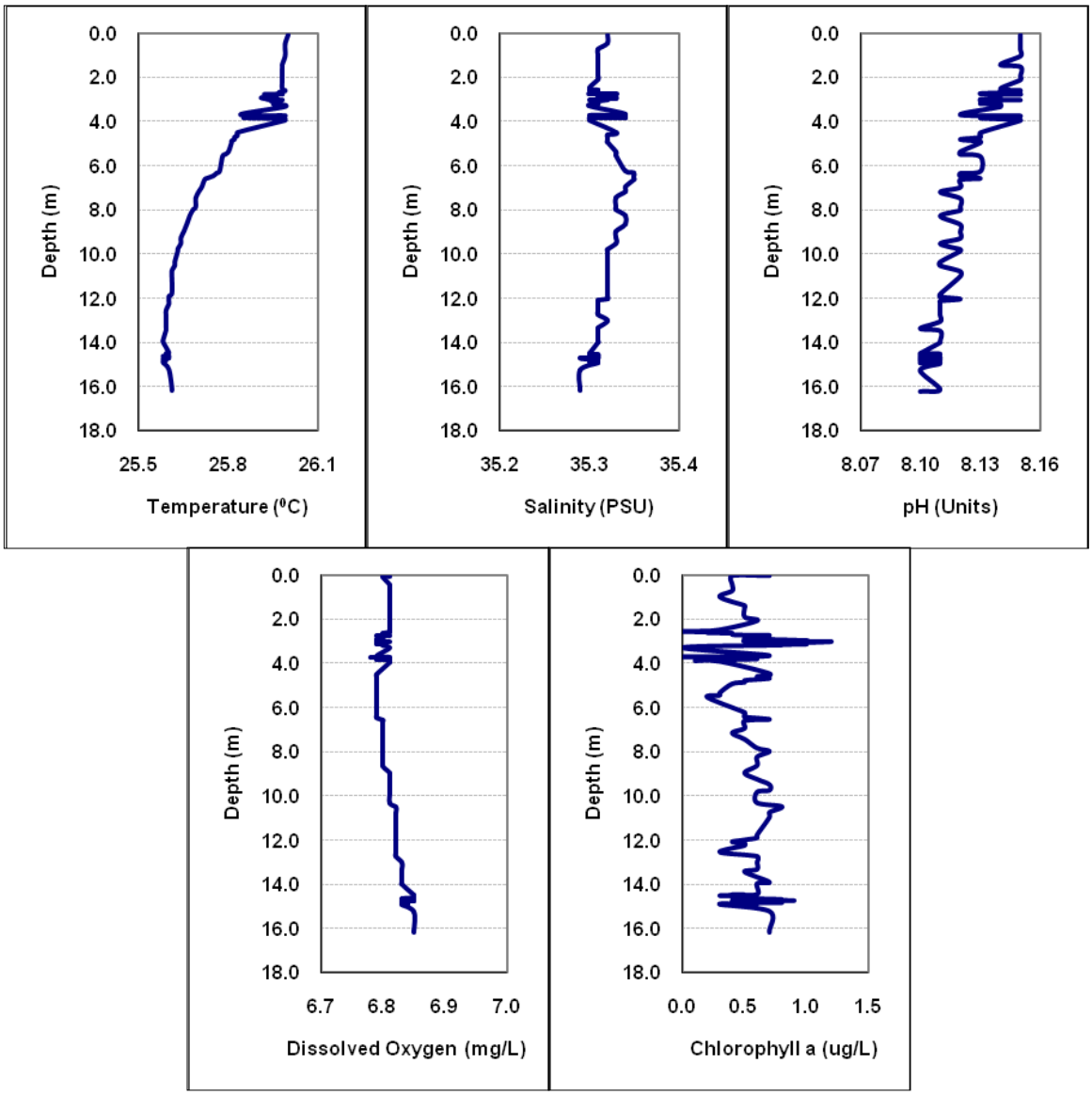

Figure 92: Boynton-Delray water quality monitoring YSI cast at station BD-11 May 2008.

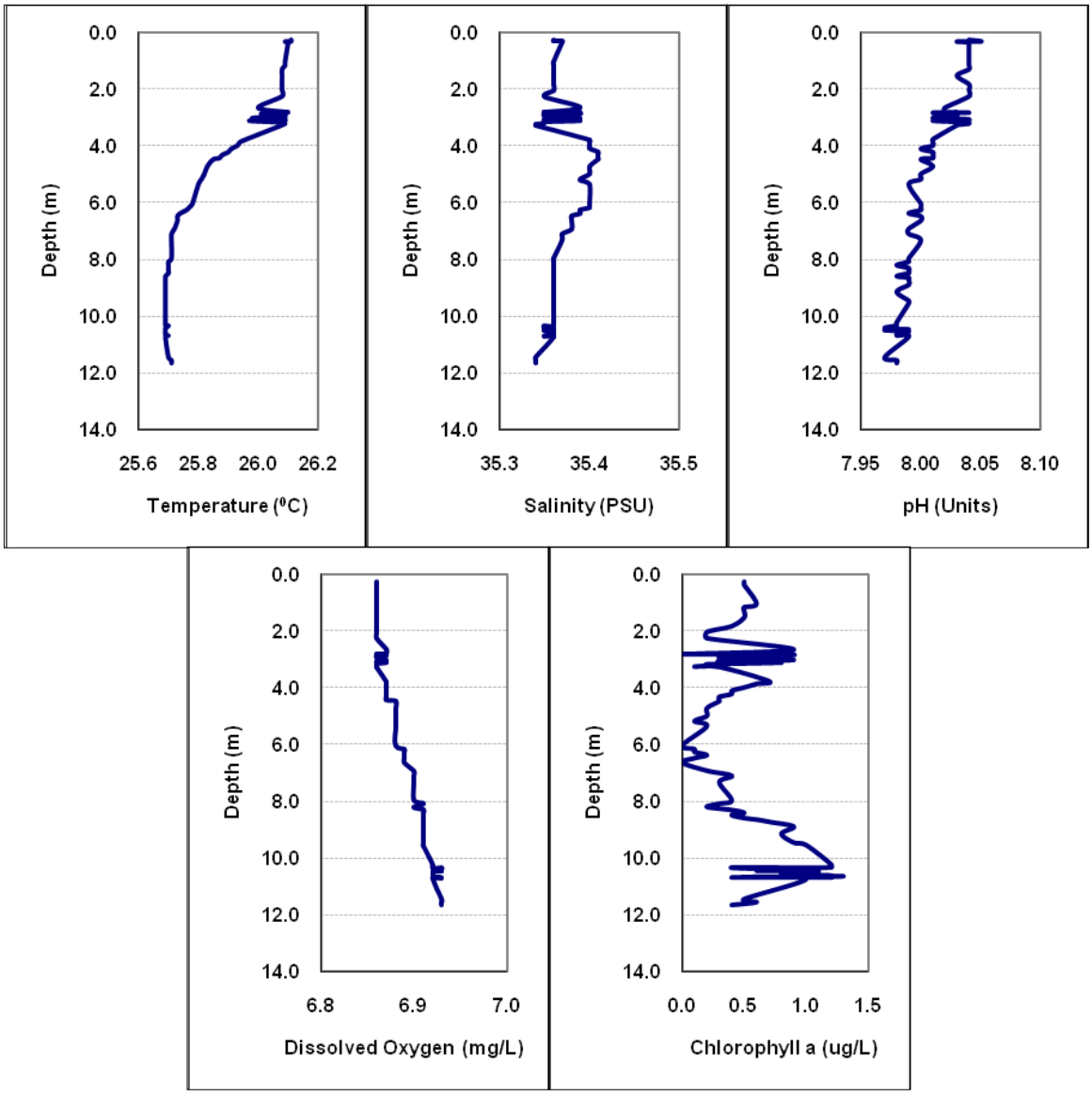

Figure 93: Boynton-Delray water quality monitoring YSI cast at station BD-12 May 2008.

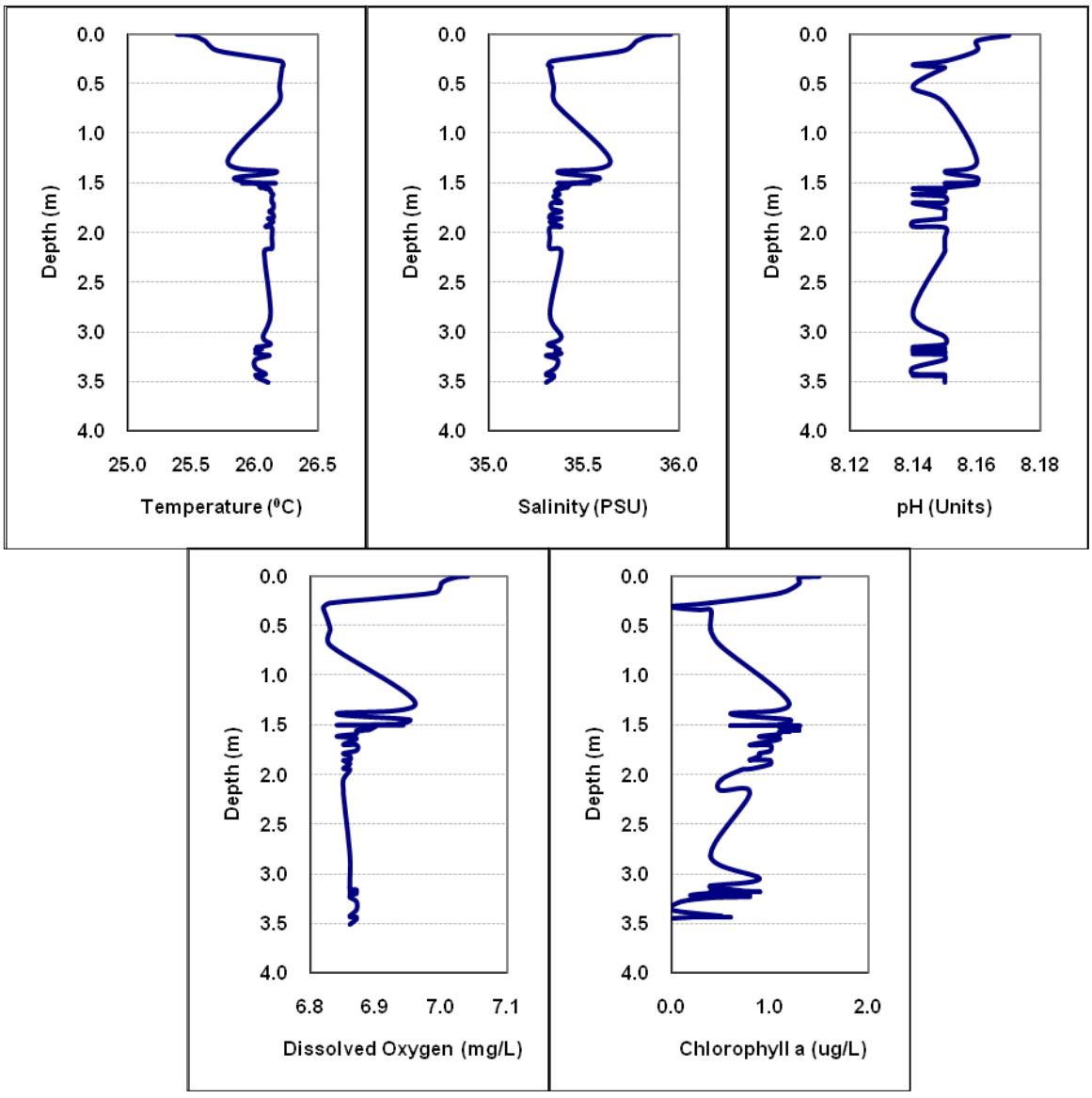

Figure 94: Boynton-Delray water quality monitoring YSI cast at station BD-14 May 2008.

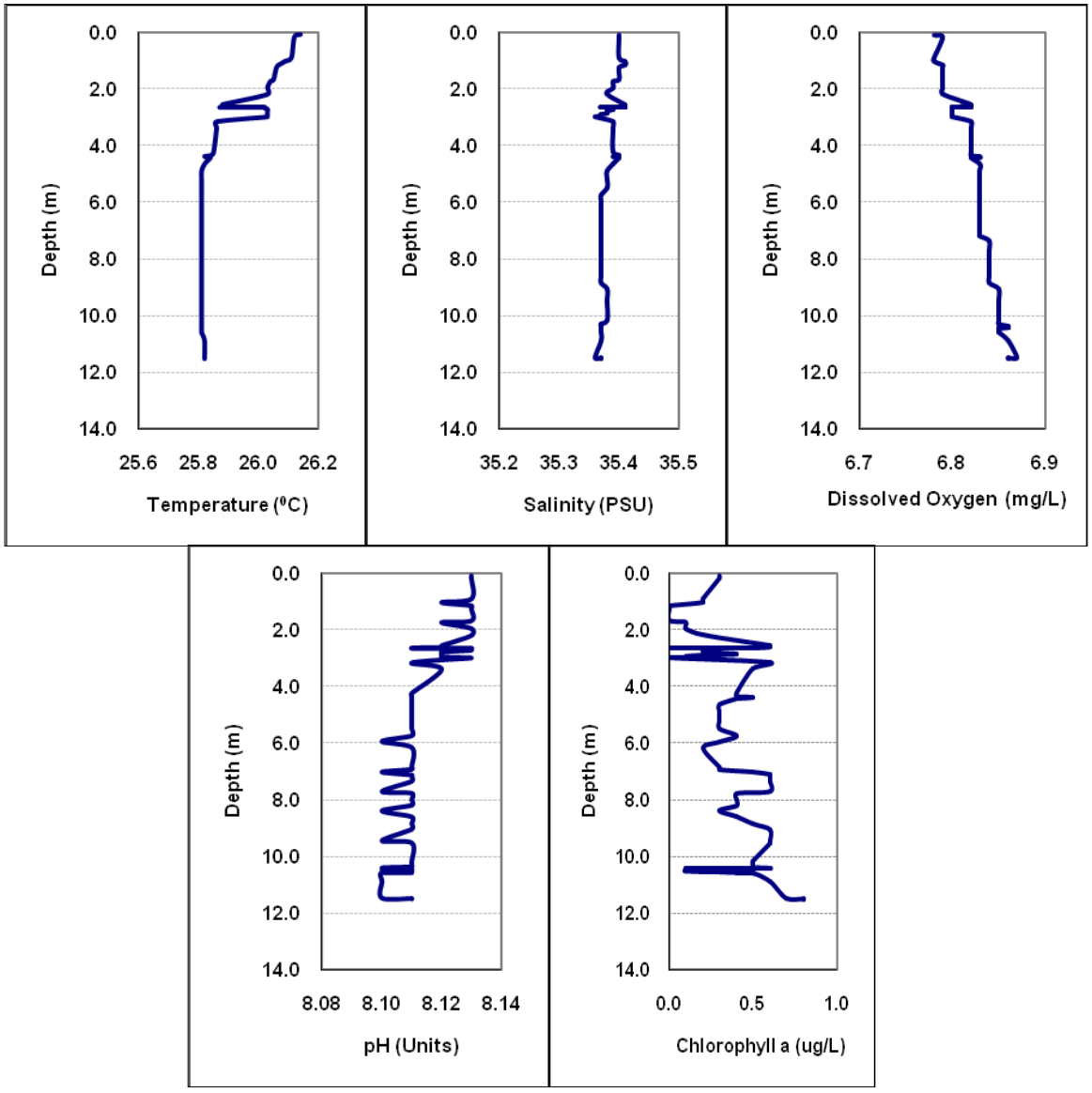

Figure 95: Boynton-Delray water quality monitoring YSI cast at station BD-15 May 2008.

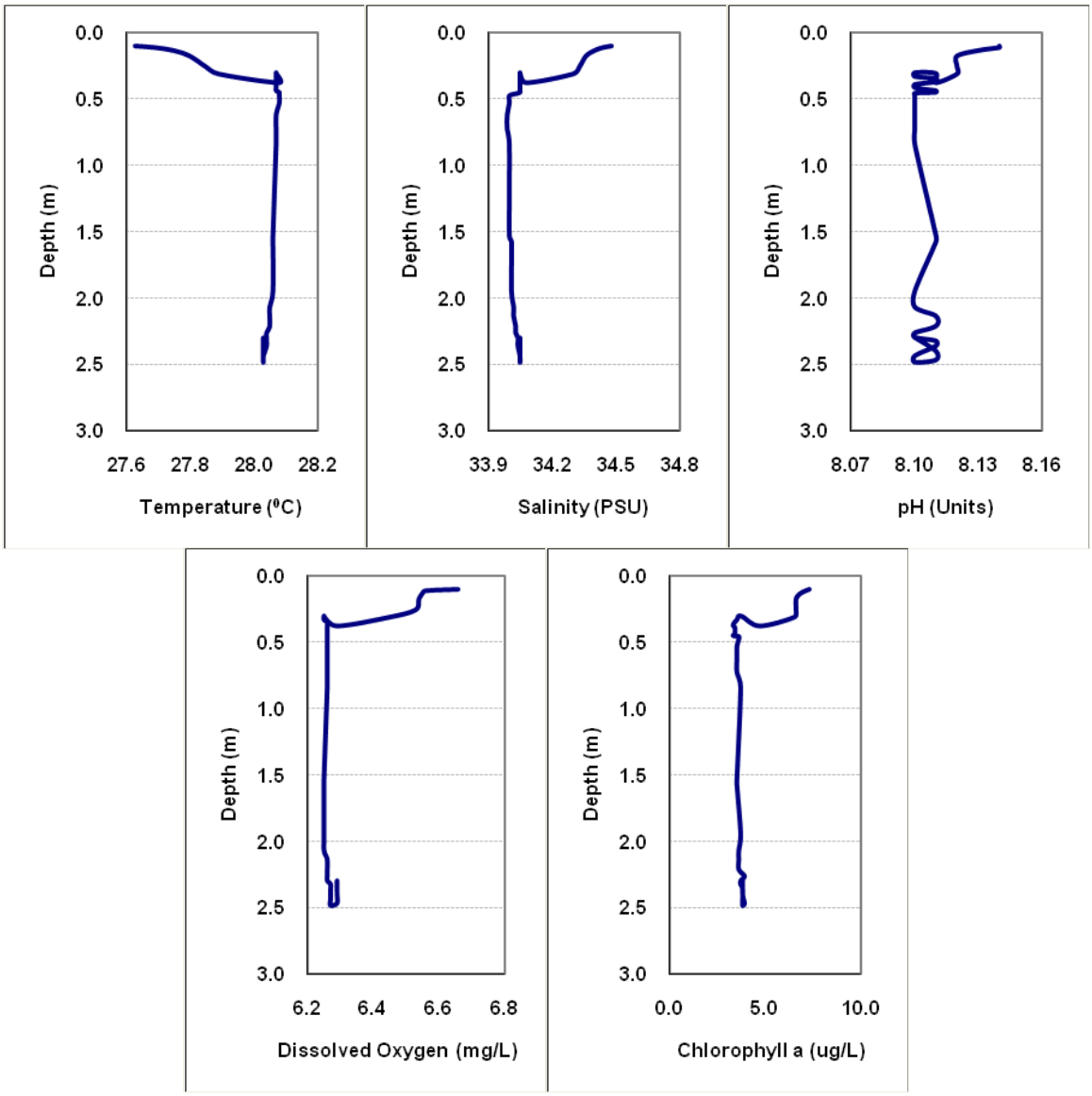

Figure 96: Boynton-Delray water quality monitoring YSI cast at station BD-16 May 2008.

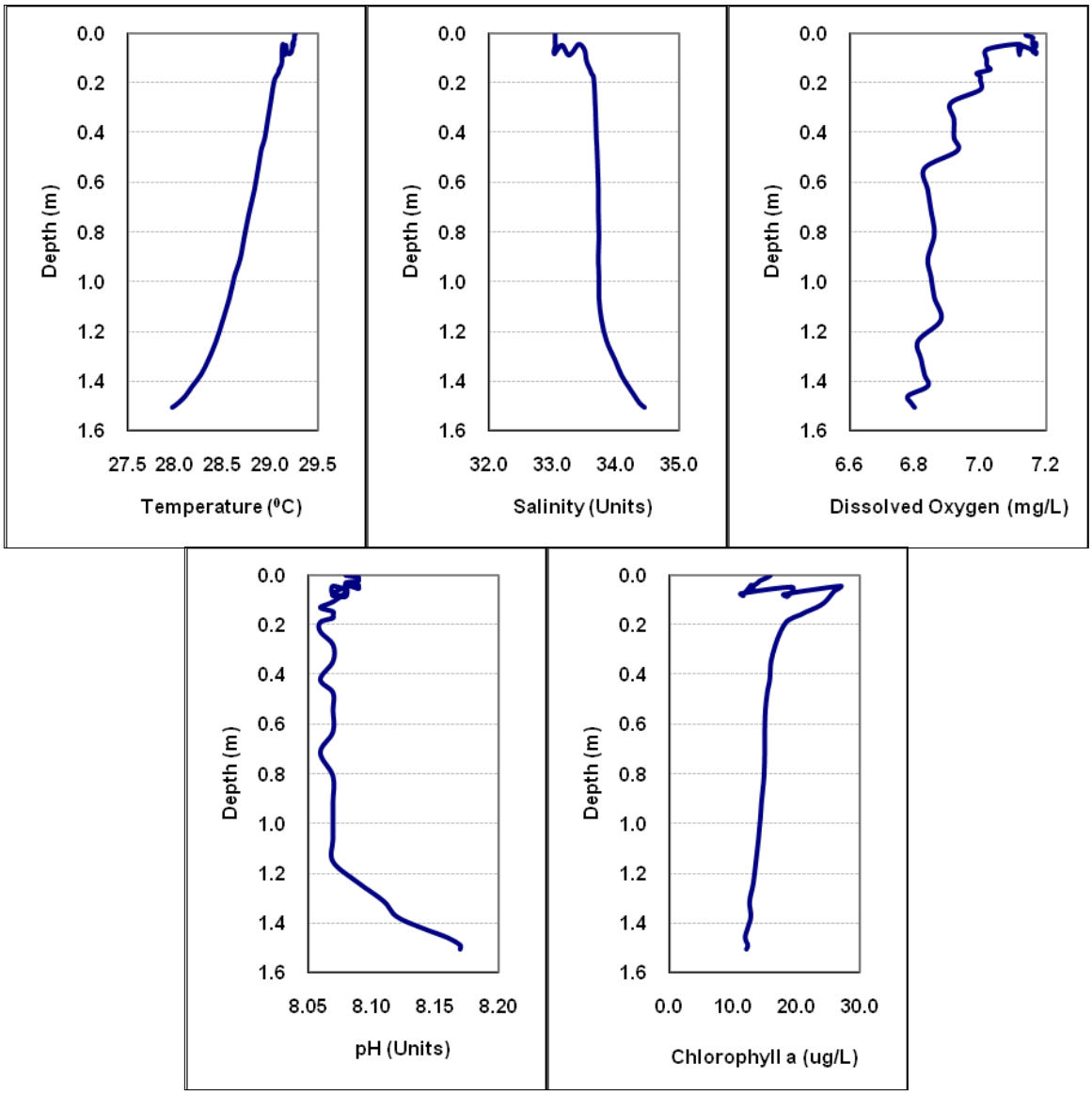

Figure 97: Boynton-Delray water quality monitoring YSI cast at station BD-17 May 2008.

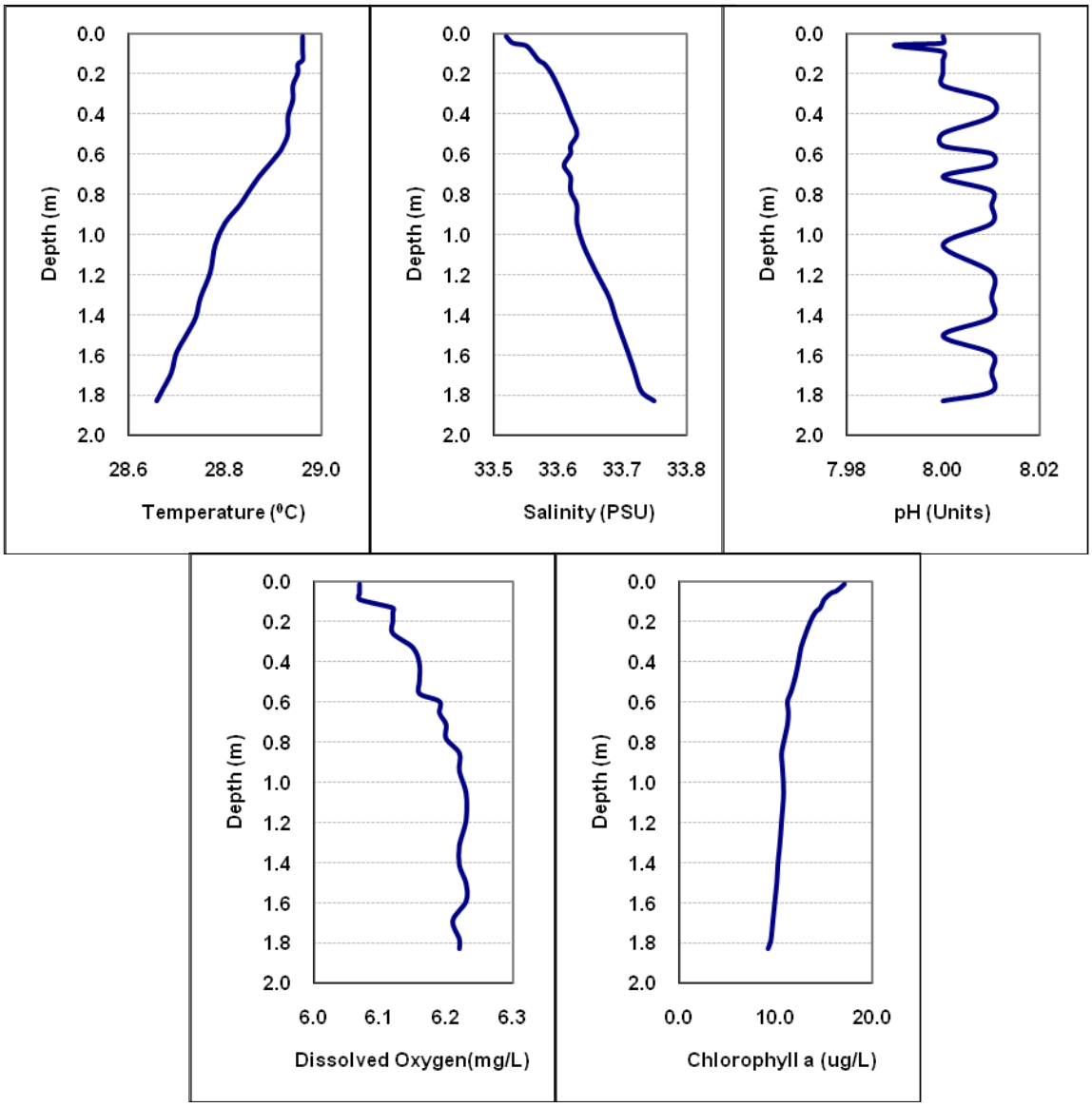

Figure 98: Boynton-Delray water quality monitoring YSI cast at station BD-18 May 2008.

9.6 JULY 2008

Water quality monitoring was conducted on July 11, 12 and 13, 2008, from the RV Walton Smith. All stations were sampled for all water quality parameters listed in Table 2. Vertical water column profiles were collected by using the ships seabird 911 CTD. A trip and equipment were collected for the cruise. The times and dates of sample collection are listed in Table 10. The water quality data is listed below in Tables 11-13. Water column profiles can be seen in Figures 111-124.

The tides on July 11th, 2008 were (04:46; 17:41) High and (11:55; 23:29) Low. On July 12th, 2008 the tides were (05:38; 18:37) High and (00:26; 12:47) Low. During the Boynton Inlet and LWL sampling on July 13th, 2008 the tides were (14:24; 01:53) high and (08:53; 21:10) Low. Seas were 2-3 feet during both days of sampling with winds out of the east at 5-10 knots. The Boynton Inlet and LWL samples were collected on July 13th by small boat on an outgoing tidal cycle. A total of 5 duplicates were collected for each of the water quality parameters sampled. The boil was not visible at the surface so sampling was conducted at the appropriate coordinates for the South Central Outfall. The current was in a northerly direction, but later changed to southerly.

NO_3-N+NO_2-N values ranged from BDL to 0.21µM over the reef and outfall, while values ranged from 1.70µM to 10.10µM in the Boynton Inlet and LWL. NH_4-N values ranged from 0.11µM to 1.08 µM for the reef and outfall sites while the values for the Boynton Inlet and LWL varied from 0.41µM to 3.62µM. Ortho-PO_4-P values were BDL for the reef and outfall areas while values ranged from BDL to 0.31µM for the Boynton Inlet and LWL. SiO_4-Si values ranged from BDL to 2.20µM over the reef and outfall sites while the Boynton Inlet and LWL values ranged from 5.90µM to 23.12µM. TDN values ranged from 4.02µM to 13.22µM for the reef and outfall stations while the Boynton Inlet and LWL stations varied from 13.63µM to 30.66µM. TDP values ranged from BDL to 0.11µM over the reef and outfall area while values varied from 0.02µM to 0.66µM for the Boynton Inlet and LWL. TDN sample BD-1A and TDP samples for BD-12A and BD-18A were no good. DOC values ranged from 36.80µM to 68.96µM for the reef and outfall sites while the Boynton Inlet and LWL sites ranged from 157.70µM to 277.04µM. DOC sample BD-1A was no good.

Temperature values ranged from 28.6^{0}C to 29.7^{0}C over the reef and outfall while values ranged from 28.6^{0}C to 29.5^{0}C for the Boynton Inlet and LWL. Salinity values varied from 35.97 to36.39 salinity units for the reef and outfall sites while the Boynton Inlet and LWL sites varied from 24.99 to 29.85 salinity units. pH values ranged from 8.03 to 8.21 units over the reef and outfall while values ranged from 8.05 to 8.29 units in the Boynton Inlet and LWL. Chlorophyll values ranged from 0.090µg/L to 0.307µg/L for the reef and outfall sites while values varied from 4.63µg/L to 6.07µg/L for the Boynton Inlet and LWL sites. Chlorophyll samples for BD-4 were no good. TSS values ranged from 0.10mg/L to 0.44mg/L over the reef and outfall while values ranged from 1.08mg/L to 2.12mg/L for the Boynton Inlet and LWL.

Water column profiles were collected for stations BD-1 thru BD-15. No profiles were collected during small boat operations to collect inlet samples (BD-13, BD-16 thru BD-18). Only minor changes were observed in the water column profiles for the water quality parameters measured. pH and turbidity profiles were not collected because the RV Walton Smith's CTD system does not have probes to measure these two parameters.

Table 26: Date and Time of water sample collection for July 2008.

Date	Time (Local)	Station	Latitude	Longitude	Depth (m)
7/11/2008	8:51	BD-1A	26.42550	-80.04545	4
7/11/2008	8:51	BD-1B	26.42550	-80.04545	17
7/11/2008	8:51	BD-1C	26.42550	-80.04545	29
7/11/2008	9:19	BD-2A	26.44201	-80.04729	3
7/11/2008	9:19	BD-2B	26.44201	-80.04729	7
7/11/2008	9:19	BD-2C	26.44201	-80.04729	15
7/11/2008	9:45	BD-3A	26.45828	-80.04247	3
7/11/2008	9:45	BD-3B	26.45828	-80.04247	8
7/11/2008	9:45	BD-3C	26.45828	-80.04247	18
7/12/2008	8:43	BD-4A	26.46192	-80.04195	4
7/11/2008	8:43	BD-4B	26.46192	-80.04195	7
7/11/2008	8:43	BD-4C	26.46192	-80.04195	17
7/11/2008	8:43	BD-4D	26.46192	-80.04195	28
7/11/2008	21:31	BD-5A	26.46620	-80.04167	3
7/11/2008	21:31	BD-5B	26.46620	-80.04167	12
7/11/2008	21:31	BD-5C	26.46620	-80.04167	24
7/11/2008	21:57	BD-6A	26.47532	-80.03976	3
7/11/2008	21:57	BD-6B	26.47532	-80.03976	6
7/11/2008	21:57	BD-6C	26.47532	-80.03976	11
7/11/2008	22:19	BD-7A	26.48737	-80.03871	3
7/11/2008	22:19	BD-7B	26.48737	-80.03871	10
7/11/2008	22:19	BD-7C	26.48737	-80.03871	22
7/11/2008	22:43	BD-8A	26.51507	-80.03542	3
7/11/2008	22:43	BD-8B	26.51507	-80.03542	11
7/11/2008	22:43	BD-8C	26.51507	-80.03542	19
7/11/2008	23:13	BD-9A	26.50838	-80.04129	3
7/11/2008	23:13	BD-9B	26.50838	-80.04129	7
7/11/2008	23:13	BD-9C	26.50838	-80.04129	14
7/11/2008	23:43	BD-10A	26.52261	-80.03223	3
7/11/2008	23:43	BD-10B	26.52261	-80.03223	10
7/11/2008	23:43	BD-10C	26.52261	-80.03223	16
7/12/2008	0:19	BD-11A	26.53333	-80.03584	3
7/12/2008	0:19	BD-11B	26.53333	-80.03584	5
7/12/2008	0:19	BD-11C	26.53333	-80.03584	11
7/12/2008	0:47	BD-12A	26.53874	-80.03980	3
7/12/2008	0:47	BD-12B	26.53874	-80.03980	4
7/12/2008	0:47	BD-12C	26.53874	-80.03980	10
7/13/2008	9:22	BD-13A	26.54542	-80.04300	0
7/12/2008	1:47	BD-14A	26.54242	-80.03996	3
7/12/2008	1:47	BD-14C	26.54242	-80.03996	6
7/12/2008	1:18	BD-15A	26.55919	-80.03329	3
7/12/2008	1:18	BD-15B	26.55919	-80.03329	4
7/12/2008	1:18	BD-15C	26.55919	-80.03329	9
7/13/2008	9:15	BD-16A	26.54618	-80.04791	0
7/13/2008	8:50	BD-17A	26.54264	-80.04790	0
7/13/2008	8:30	BD-18A	26.53950	-80.04951	0

Table 27: July 2008 Boynton-Delray nutrient and DOC values in µM.

Station	Depth (m)	N+N (µM)	NH4 (µM)	P (µM)	Si (µM)	TDN (µM)	TDP (µM)	DOC (µM)
BD-1A	4	0.13	0.24	BDL	BDL	N/A	0.01	N/A
BD-1B	17	0.16	0.67	BDL	BDL	6.71	0.01	64.03
BD-1C	29	0.05	0.67	BDL	BDL	8.14	0.06	50.37
BD-2A	3	BDL	0.72	BDL	BDL	6.43	0.04	74.33
BD-2B	7	BDL	0.70	BDL	BDL	7.61	0.10	63.88
BD-2C	15	BDL	0.72	BDL	BDL	7.35	0.04	58.36
BD-3A	3	BDL	0.66	BDL	BDL	7.53	0.04	54.69
BD-3B	8	0.06	0.65	BDL	BDL	4.96	0.02	56.80
BD-3C	18	0.11	1.08	BDL	0.32	6.92	0.05	56.09
BD-4A	4	0.18	0.72	BDL	0.64	5.92	0.04	62.63
BD-4B	7	0.08	0.11	BDL	0.86	5.33	BDL	51.42
BD-4C	17	0.07	0.34	BDL	1.70	5.63	BDL	53.78
BD-4D	28	0.12	0.63	BDL	2.20	5.25	0.01	57.40
BD-5A	3	0.12	0.64	BDL	2.20	4.02	0.10	43.48
BD-5B	12	BDL	0.53	BDL	1.90	5.33	0.04	56.90
BD-5C	24	BDL	0.62	BDL	1.90	13.22	0.02	57.80
BD-6A	3	0.09	0.80	BDL	2.10	6.22	0.02	58.00
BD-6B	6	BDL	0.53	BDL	1.50	10.12	0.05	48.00
BD-6C	11	BDL	0.51	BDL	1.50	5.98	0.04	44.29
BD-7A	3	0.18	0.69	BDL	1.40	4.76	0.07	41.02
BD-7B	10	0.07	0.73	BDL	1.20	6.41	0.05	50.01
BD-7C	22	BDL	0.75	BDL	1.00	8.64	0.02	45.79
BD-8A	3	0.05	0.83	BDL	1.20	5.74	0.05	42.38
BD-8B	11	0.08	1.08	BDL	0.94	5.80	0.02	65.24
BD-8C	19	0.07	0.77	BDL	0.97	6.22	BDL	49.96
BD-9A	3	0.07	0.79	BDL	0.80	6.13	0.05	54.29
BD-9B	7	BDL	0.70	BDL	0.78	5.99	0.01	49.86
BD-9C	14	0.07	0.74	BDL	0.75	5.78	0.04	44.59
BD-10A	3	BDL	0.91	BDL	0.61	6.67	0.05	47.80
BD-10B	10	0.21	0.90	BDL	0.70	6.24	0.01	50.87
BD-10C	16	0.09	0.83	BDL	1.10	6.06	0.06	52.38
BD-11A	3	0.07	0.82	BDL	1.30	6.36	0.04	45.89
BD-11B	5	0.05	0.75	BDL	1.10	7.37	BDL	51.47
BD-11C	11	BDL	0.73	BDL	1.10	7.98	BDL	48.31
BD-12A	3	0.11	0.63	BDL	1.00	6.47	0.05	39.81
BD-12B	4	BDL	0.57	BDL	1.00	5.94	0.01	36.80
BD-12C	10	BDL	0.23	BDL	BDL	4.99	N/A	63.88
BD-13A	0	9.00	1.18	0.10	13.40	17.98	0.02	176.54
BD-14A	3	BDL	0.26	BDL	0.92	7.26	0.04	68.56
BD-14C	6	BDL	0.25	BDL	0.96	5.86	0.04	57.50
BD-15A	3	0.08	0.34	BDL	1.00	6.21	0.01	47.15
BD-15B	4	0.08	0.24	BDL	1.00	6.87	BDL	55.49
BD-15C	9	BDL	0.23	BDL	1.00	5.93	0.11	68.96
BD-16A	0	10.10	0.41	BDL	5.90	13.63	0.66	157.70
BD-17A	0	1.70	3.62	0.31	23.10	30.66	0.56	277.04
BD-18A	0	1.96	2.11	0.29	22.80	24.37	N/A	265.89

Table 28: July 2008 Boynton-Delray nutrient and DOC values in mg/L.

Station	Depth (m)	N+N (mg/L)	NH4 (mg/L)	P (mg/L)	Si (mg/L)	TDN (mg/L)	TDP (mg/L)	DOC (mg/L)
BD-1A	4	0.002	0.003	BDL	BDL	N/A	BDL	N/A
BD-1B	17	0.002	0.009	BDL	BDL	0.09	BDL	0.90
BD-1C	29	0.001	0.009	BDL	BDL	0.11	0.002	0.71
BD-2A	3	BDL	0.010	BDL	BDL	0.09	0.001	1.04
BD-2B	7	BDL	0.010	BDL	BDL	0.11	0.003	0.89
BD-2C	15	BDL	0.010	BDL	BDL	0.10	0.001	0.82
BD-3A	3	BDL	0.009	BDL	BDL	0.11	0.001	0.77
BD-3B	8	0.001	0.009	BDL	BDL	0.07	0.001	0.80
BD-3C	18	0.002	0.015	BDL	0.009	0.10	0.001	0.79
BD-4A	4	0.003	0.010	BDL	0.018	0.08	0.001	0.88
BD-4B	7	0.001	0.002	BDL	0.024	0.07	BDL	0.72
BD-4C	17	0.001	0.005	BDL	0.048	0.08	BDL	0.75
BD-4D	28	0.031	0.009	BDL	1.607	0.07	BDL	0.80
BD-5A	3	0.002	0.009	BDL	0.062	0.06	0.003	0.61
BD-5B	12	BDL	0.007	BDL	0.053	0.07	0.001	0.80
BD-5C	24	BDL	0.009	BDL	0.053	0.19	0.001	0.81
BD-6A	3	0.001	0.011	BDL	0.059	0.09	0.001	0.81
BD-6B	6	BDL	0.007	BDL	0.042	0.14	0.001	0.67
BD-6C	11	BDL	0.007	BDL	0.042	0.08	0.001	0.62
BD-7A	3	0.003	0.010	BDL	0.039	0.07	0.002	0.57
BD-7B	10	0.001	0.010	BDL	0.034	0.09	0.001	0.70
BD-7C	22	BDL	0.011	BDL	0.028	0.12	0.001	0.64
BD-8A	3	0.001	0.012	BDL	0.034	0.08	0.001	0.59
BD-8B	11	0.001	0.015	BDL	0.026	0.08	0.001	0.91
BD-8C	19	0.001	0.011	BDL	0.027	0.09	BDL	0.70
BD-9A	3	0.001	0.011	BDL	0.022	0.09	0.001	0.76
BD-9B	7	BDL	0.010	BDL	0.022	0.08	BDL	0.70
BD-9C	14	0.001	0.010	BDL	0.021	0.08	0.001	0.62
BD-10A	3	BDL	0.013	BDL	0.017	0.09	0.001	0.67
BD-10B	10	0.003	0.013	BDL	0.020	0.09	BDL	0.71
BD-10C	16	0.001	0.012	BDL	0.031	0.08	0.002	0.73
BD-11A	3	0.001	0.012	BDL	0.036	0.09	0.001	0.64
BD-11B	5	0.001	0.010	BDL	0.031	0.10	BDL	0.72
BD-11C	11	BDL	0.010	BDL	0.031	0.11	BDL	0.68
BD-12A	3	0.002	0.009	BDL	0.028	0.09	0.001	0.56
BD-12B	4	BDL	0.008	BDL	0.028	0.08	BDL	0.52
BD-12C	10	BDL	0.003	BDL	BDL	0.07	N/A	0.89
BD-13A	0	0.126	0.016	0.003	0.375	0.25	0.001	2.47
BD-14A	3	BDL	0.004	BDL	0.026	0.10	0.001	0.96
BD-14C	6	BDL	0.003	BDL	0.027	0.08	0.001	0.81
BD-15A	3	0.001	0.005	BDL	0.028	0.09	BDL	0.66
BD-15B	4	0.001	0.003	BDL	0.028	0.10	BDL	0.59
BD-15C	9	BDL	0.003	BDL	0.028	0.08	0.003	0.97
BD-16A	0	0.141	0.006	BDL	0.165	0.19	0.020	2.21
BD-17A	0	0.024	0.051	0.010	0.647	0.43	0.017	3.88
BD-18A	0	0.027	0.030	0.009	0.638	0.33	N/A	4.05

Table 29: July 2008 Boynton-Delray pH, TSS, Chlorophyll.

Station	Depth (m)	Temperature (^{0}C)	Salinity (Units)	pH (Units)	Chlorophyll a (μg/L)	Phaeopigments (μg/L)	TSS (mg/L)
BD-1A	4	28.9	36.22	8.04	0.236	0.111	0.30
BD-1B	17	28.8	36.38	8.05	0.125	0.044	0.20
BD-1C	29	29.0	36.38	8.09	0.128	0.051	0.19
BD-2A	3	29.0	36.16	8.07	0.298	0.104	0.29
BD-2B	7	29.0	36.22	8.03	0.280	0.091	0.37
BD-2C	15	28.9	36.32	8.05	0.203	0.103	0.26
BD-3A	3	29.0	36.15	8.04	0.292	0.089	0.26
BD-3B	8	29.0	36.27	8.07	0.184	0.055	0.22
BD-3C	18	28.7	36.34	8.09	0.214	0.073	0.18
BD-4A	4	29.1	36.21	8.08	0.093	0.066	0.10
BD-4B	7	29.1	36.21	8.08	0.108	0.036	0.14
BD-4C	17	29.0	36.32	8.10	0.090	0.027	0.15
BD-4D	28	28.7	36.37	8.12	N/A	N/A	0.17
BD-5A	3	29.7	35.97	8.09	0.280	0.086	0.44
BD-5B	12	29.0	36.26	8.09	0.302	0.095	0.26
BD-5C	24	28.6	36.39	8.13	0.256	0.069	0.23
BD-6A	3	29.5	36.06	8.08	0.244	0.096	0.42
BD-6B	6	29.1	36.23	8.09	0.245	0.102	0.37
BD-6C	11	29.0	36.29	8.11	0.245	0.087	0.38
BD-7A	3	29.2	36.21	8.11	0.307	0.088	0.28
BD-7B	10	28.9	36.32	8.15	0.235	0.069	0.30
BD-7C	22	28.6	36.39	8.17	0.185	0.081	0.22
BD-8A	3	29.2	36.20	8.17	0.248	0.132	0.21
BD-8B	11	29.0	36.31	8.18	0.139	0.058	0.17
BD-8C	19	28.9	36.32	8.20	0.189	0.053	0.17
BD-9A	3	29.0	36.26	8.11	0.280	0.083	0.31
BD-9B	7	29.0	36.30	8.11	0.266	0.089	0.31
BD-9C	14	20.9	36.31	8.13	0.256	0.065	0.29
BD-10A	3	29.4	36.09	8.16	0.213	0.063	0.22
BD-10B	10	29.1	36.25	8.17	0.136	0.035	0.19
BD-10C	16	29.1	36.27	8.17	0.181	0.070	0.22
BD-11A	3	29.2	36.15	8.18	0.256	0.092	0.28
BD-11B	5	29.1	36.21	8.18	0.242	0.096	0.42
BD-11C	11	29.0	36.26	8.20	0.254	0.105	0.33
BD-12A	3	29.2	36.24	8.19	0.213	0.089	0.30
BD-12B	4	29.2	36.24	8.20	0.214	0.093	0.31
BD-12C	10	29.2	36.25	8.21	0.216	0.106	0.34
BD-13A	0	29.5	29.85	8.28	4.629	1.728	2.06
BD-14A	3	29.2	36.24	8.09	0.263	0.103	0.33
BD-14C	6	29.2	36.24	8.10	0.232	0.123	0.36
BD-15A	3	29.1	36.26	8.14	0.231	0.100	0.30
BD-15B	4	29.1	36.25	8.16	0.208	0.094	0.27
BD-15C	9	29.1	36.26	8.16	0.224	0.089	0.22
BD-16A	0	29.5	28.62	8.29	5.165	1.704	1.96
BD-17A	0	28.6	24.99	8.05	4.496	1.825	1.08
BD-18A	0	29.5	25.18	8.14	6.073	2.656	2.12

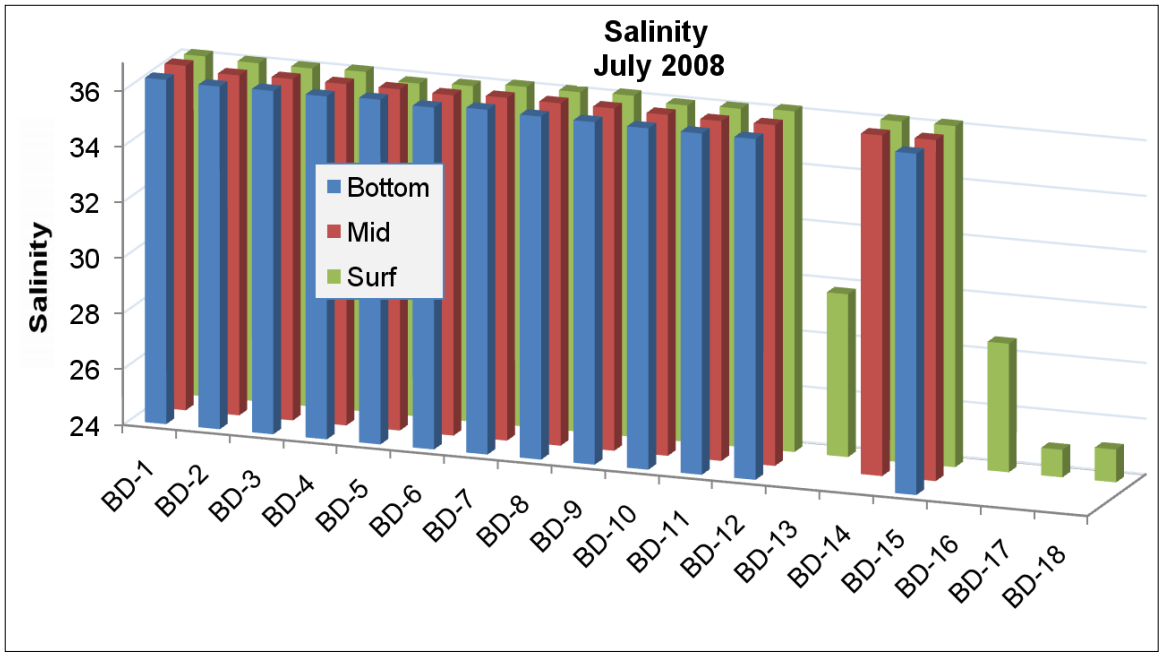

Figure 99: July 2008 salinity values for the Boynton-Delray water quality monitoring stations.

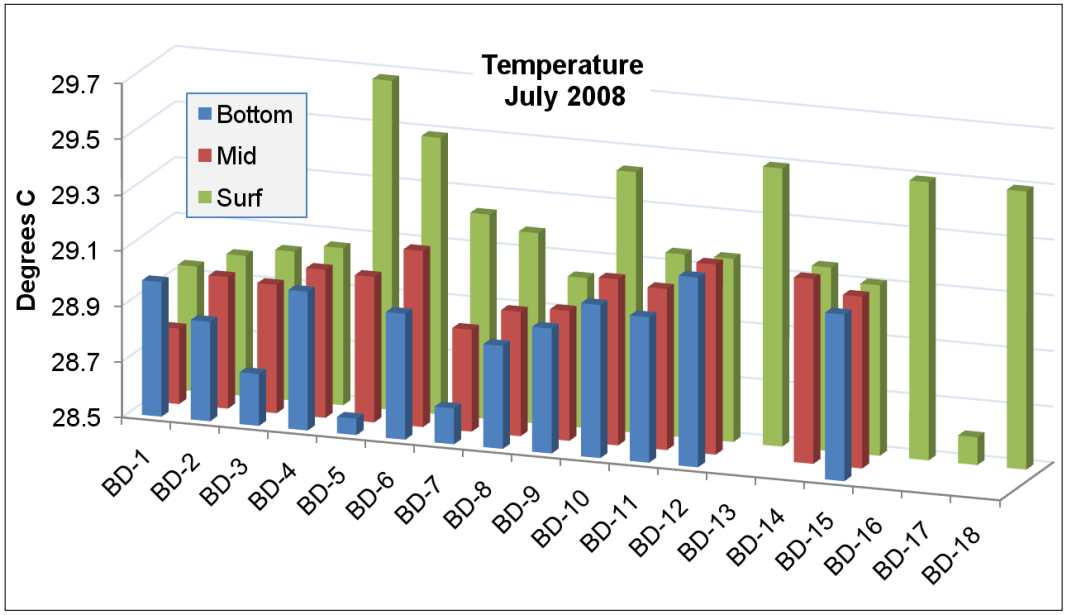

Figure 100: July 2008 temperature measurements for the Boynton-Delray water quality monitoring stations.

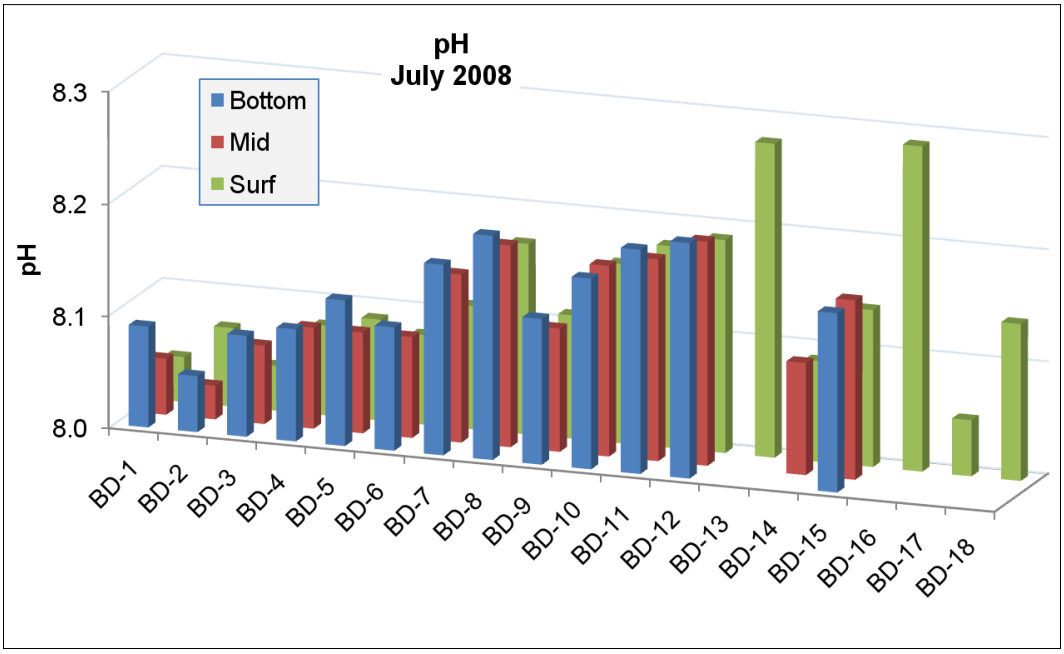

Figure 101: July 2008 pH measurements for the Boynton-Delray water quality monitoring stations.

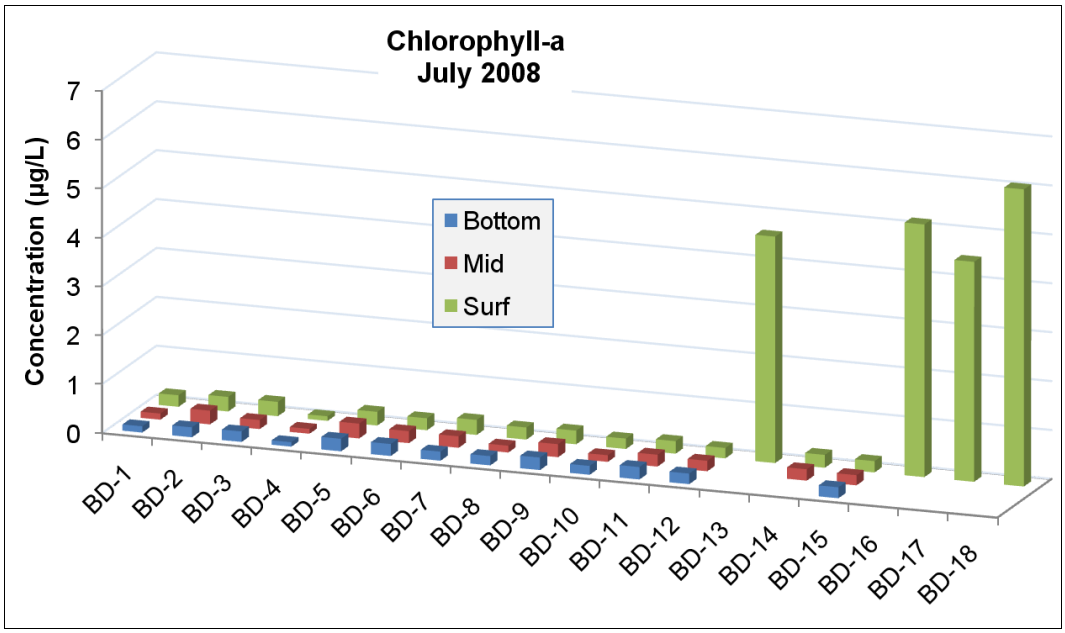

Figure 102: July 2008 chlorophyl concentrations for the Boynton-Delray water quality monitoring stations.

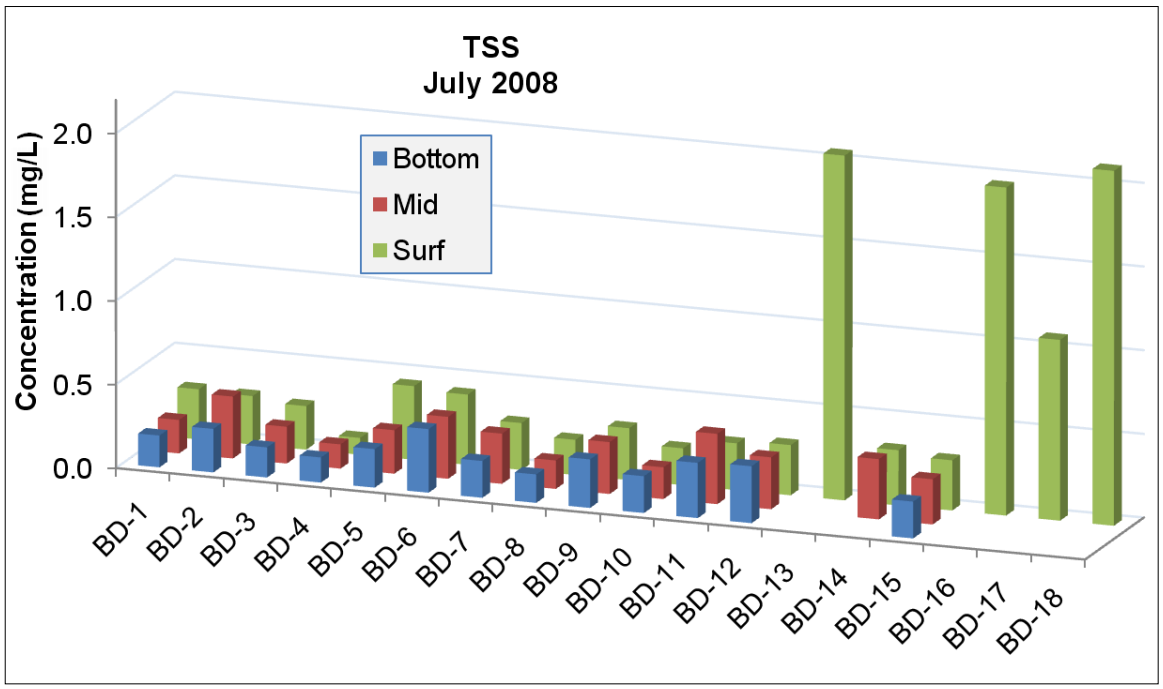

Figure 103: July 2008 TSS concentrations for the Boynton-Delray water quality monitoring stations.

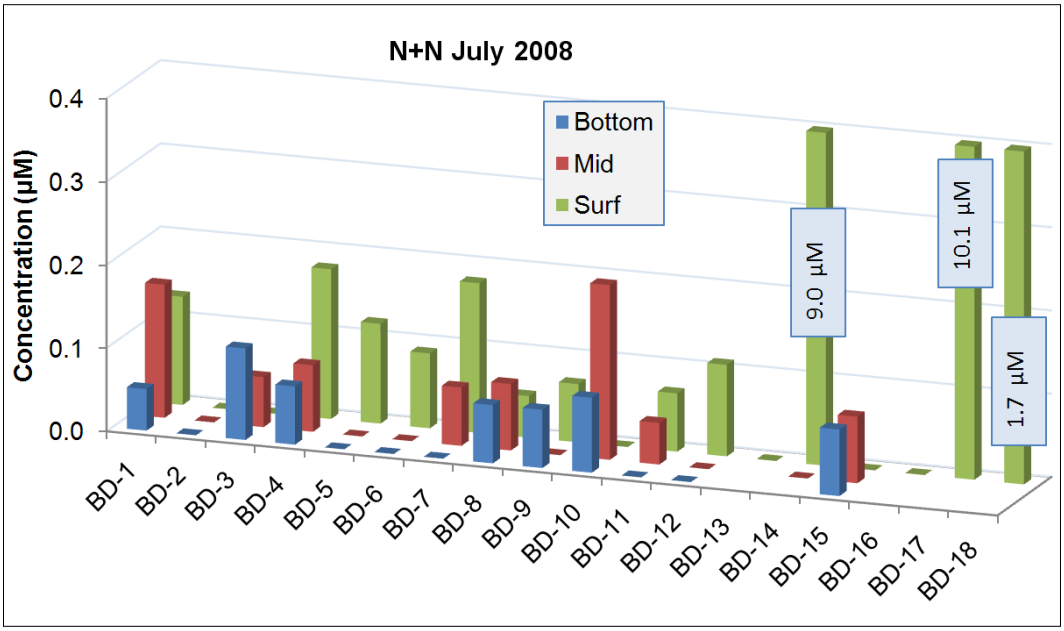

Figure 104: July 2008 N+N concentrations for the Boynton-Delray water quality monitoring stations. Concentrations higher than 0.4 µM are specifically denoted.

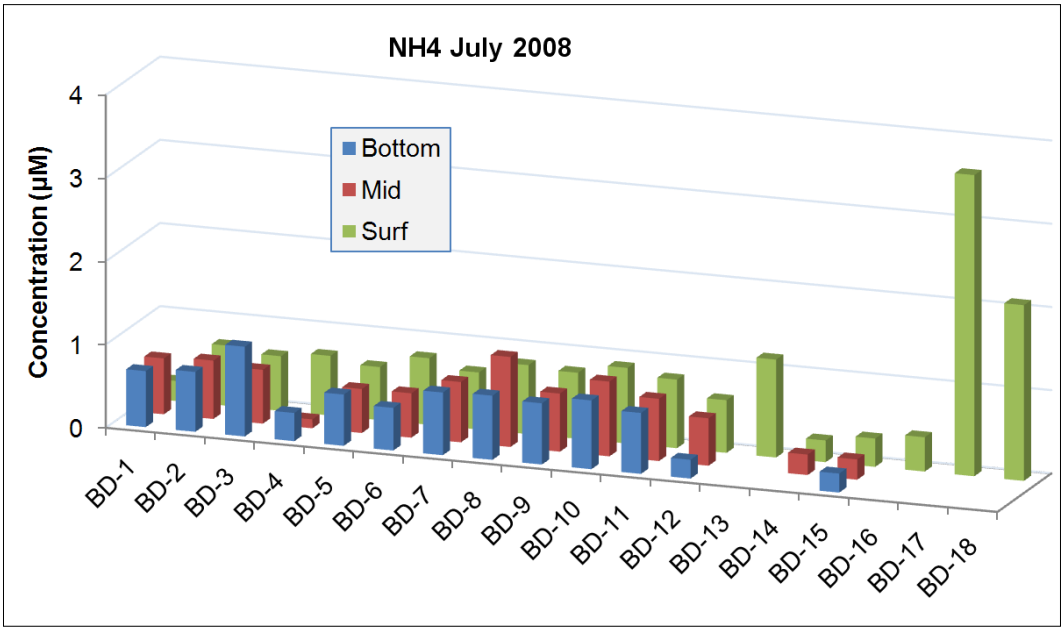

Figure 105: July 2008 NH4 concentrations for the Boynton-Delray water quality monitoring stations.

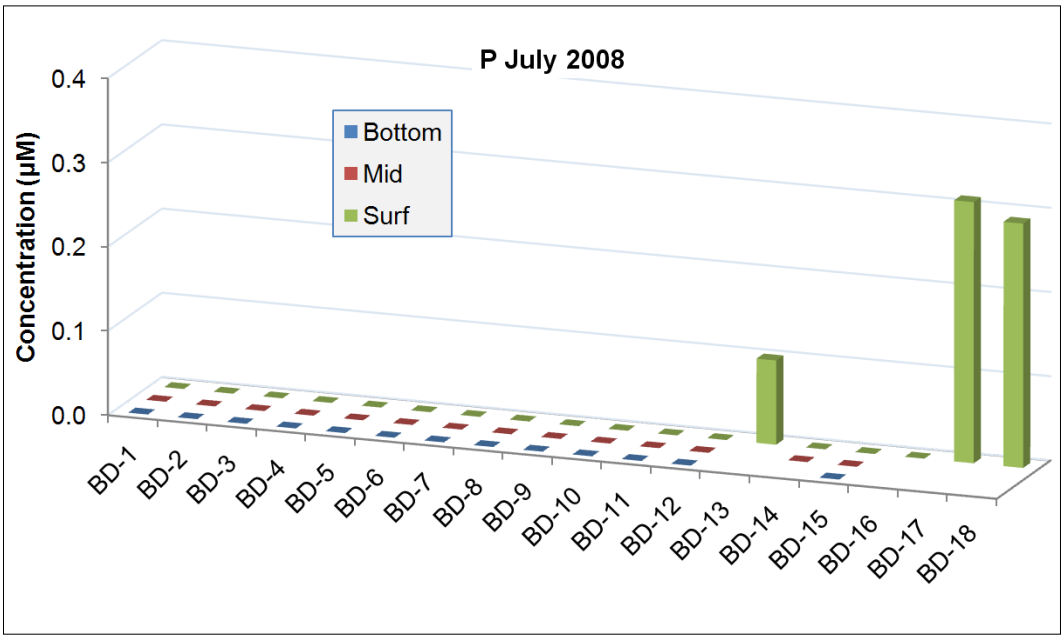

Figure 106: July 2008 P concentrations for the Boynton-Delray water quality monitoring stations.

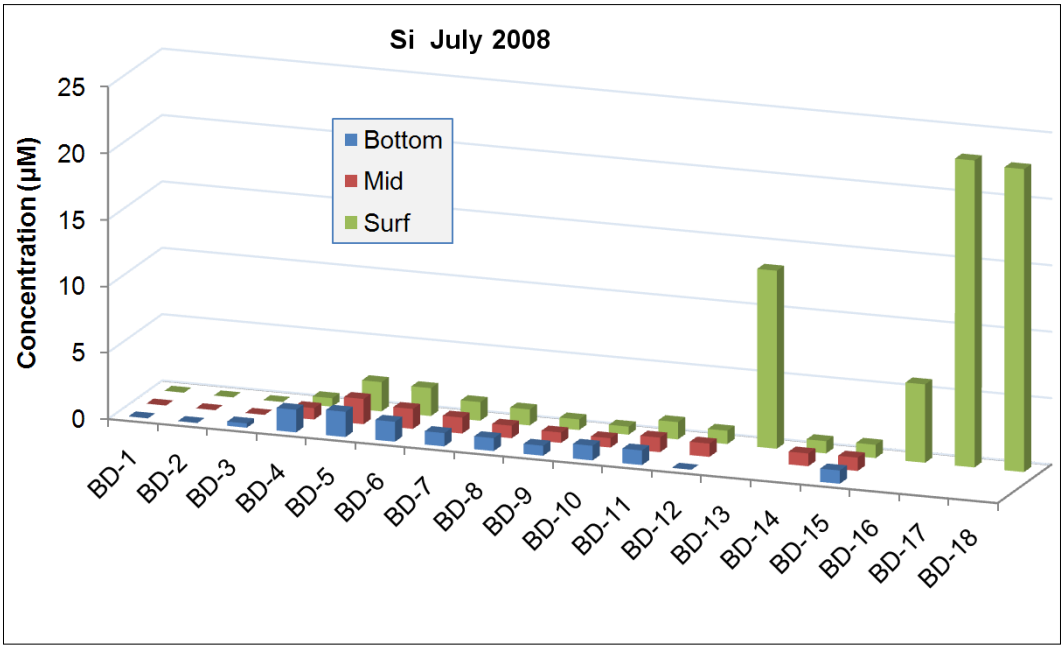

Figure 107: July 2008 Si concentrations for the Boynton-Delray water quality monitoring stations.

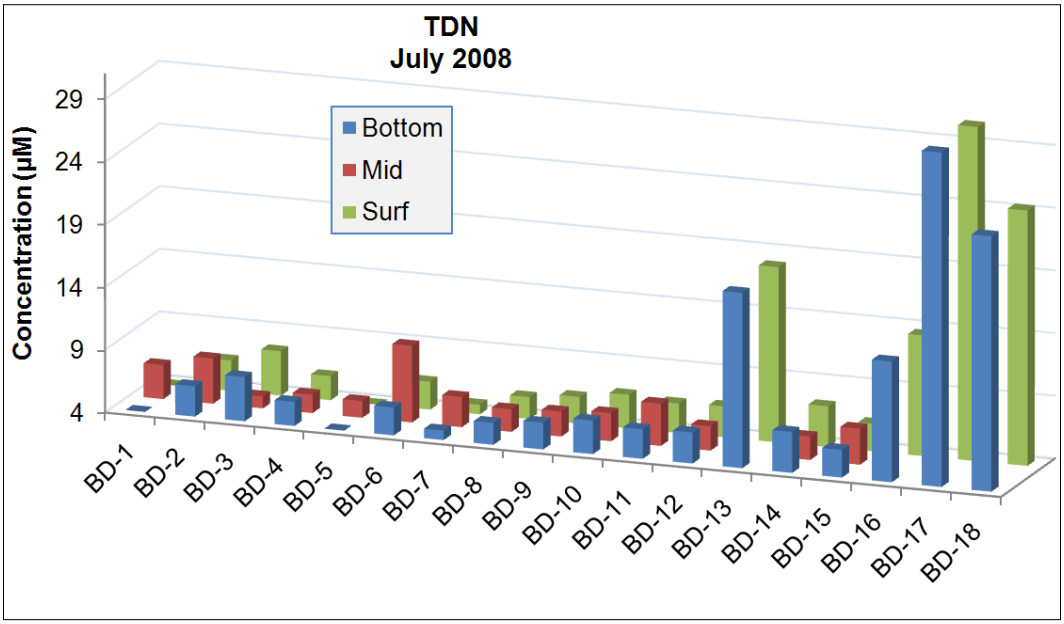

Figure 108: July 2008 TDN concentrations for the Boynton-Delray water quality monitoring stations.

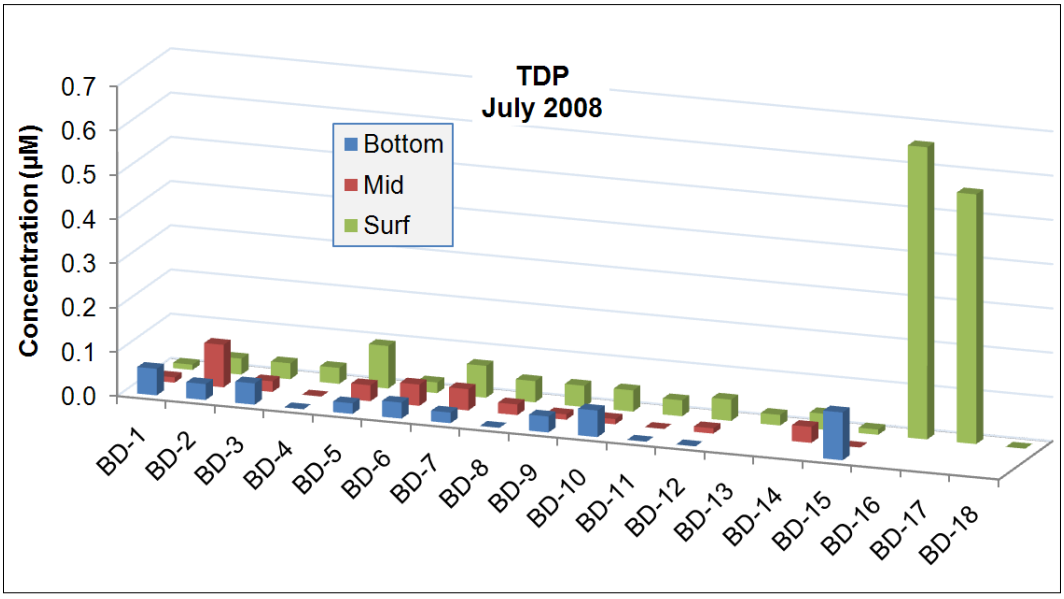

Figure 109: July 2008 TDP concentrations values for the Boynton-Delray water quality monitoring stations.

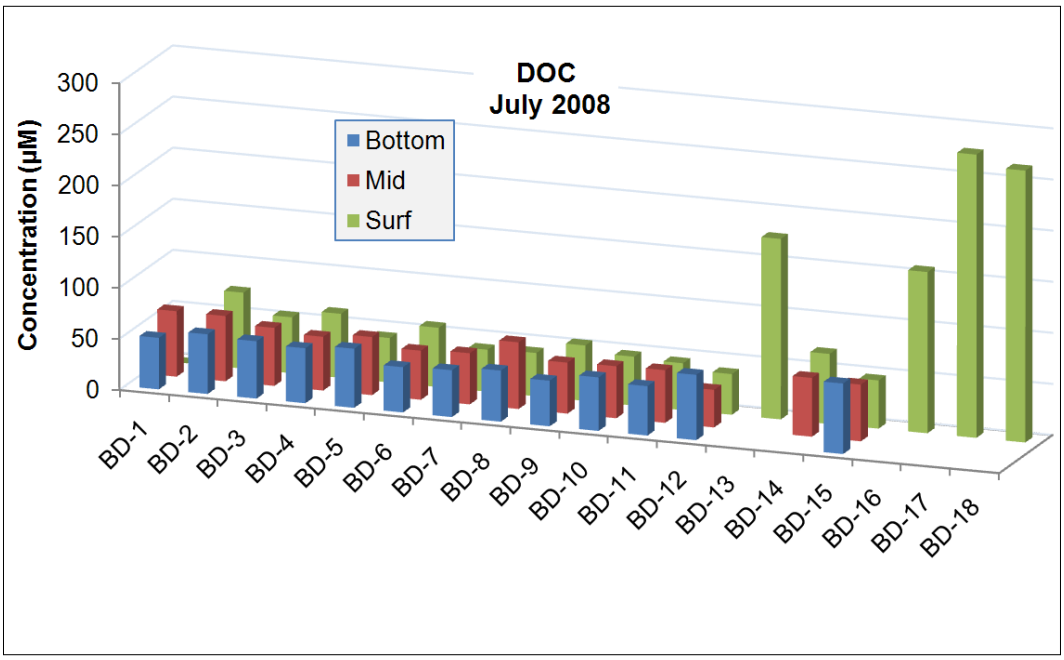

Figure 110: July 2008 DOC concentrations for the Boynton-Delray water quality monitoring stations.

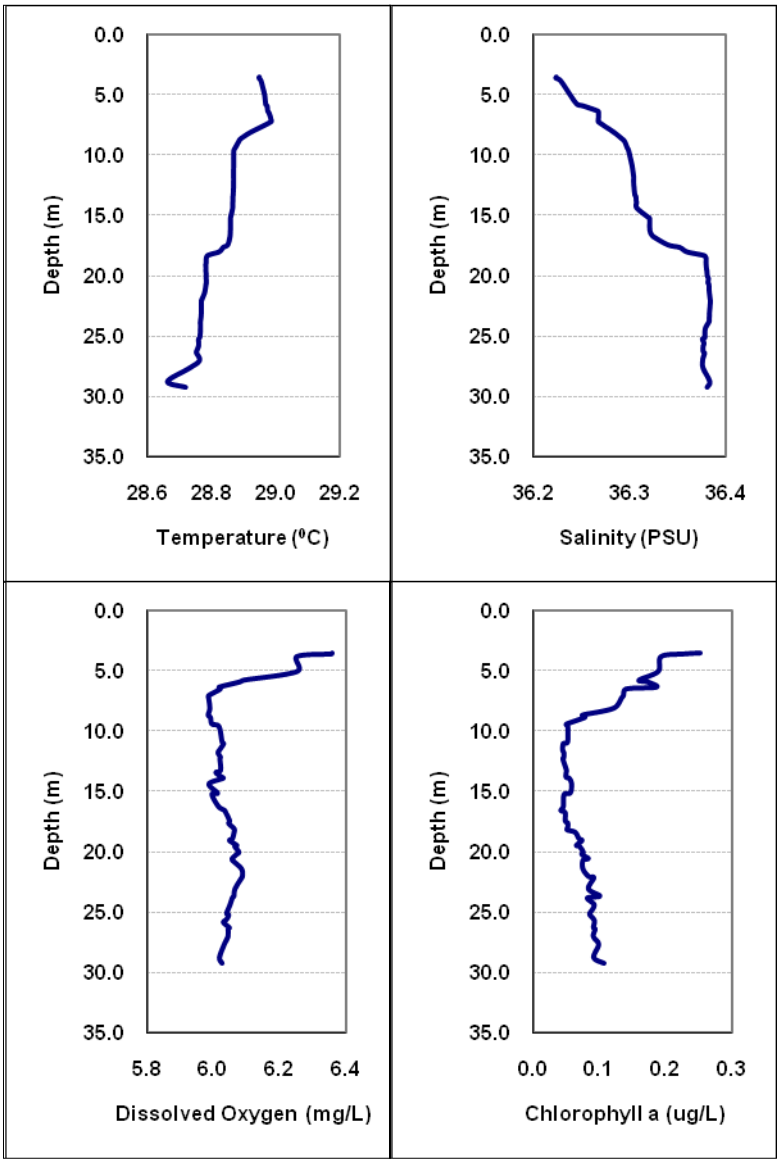

Figure 111: Boynton-Delray water quality monitoring CTD cast at station BD-1 July 2008.

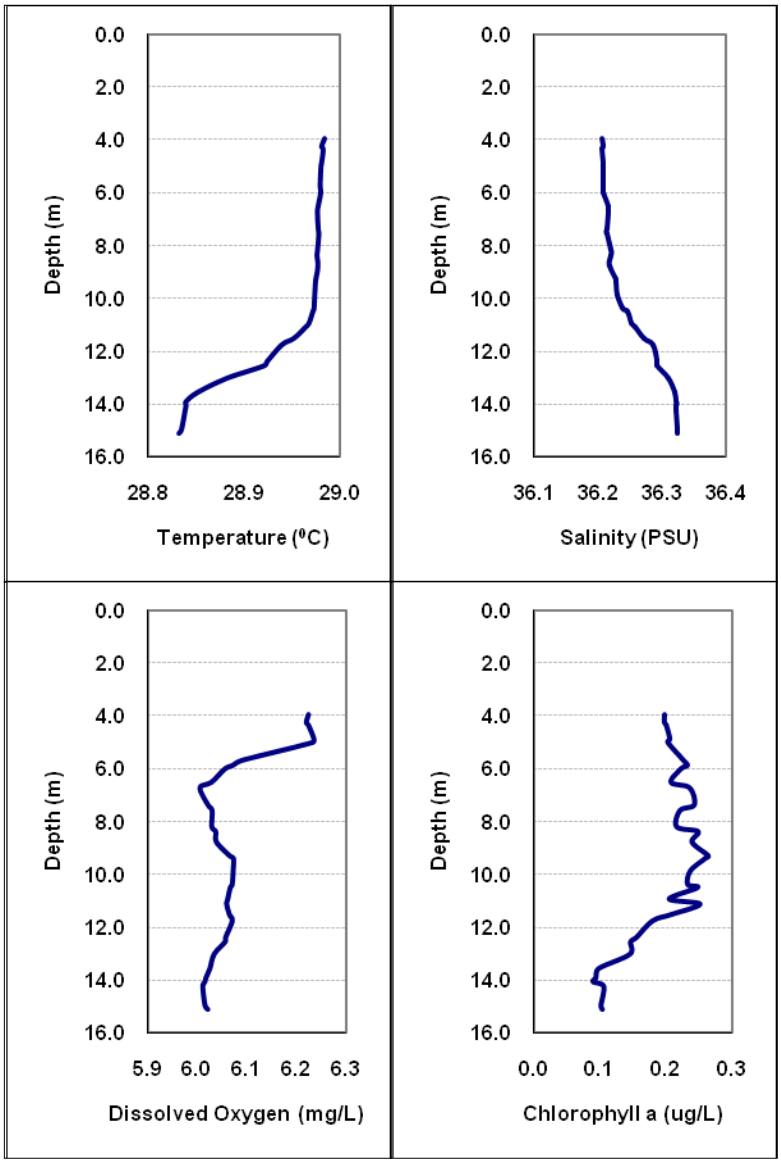

Figure 112: Boynton-Delray water quality monitoring CTD cast at station BD-2 July 2008.

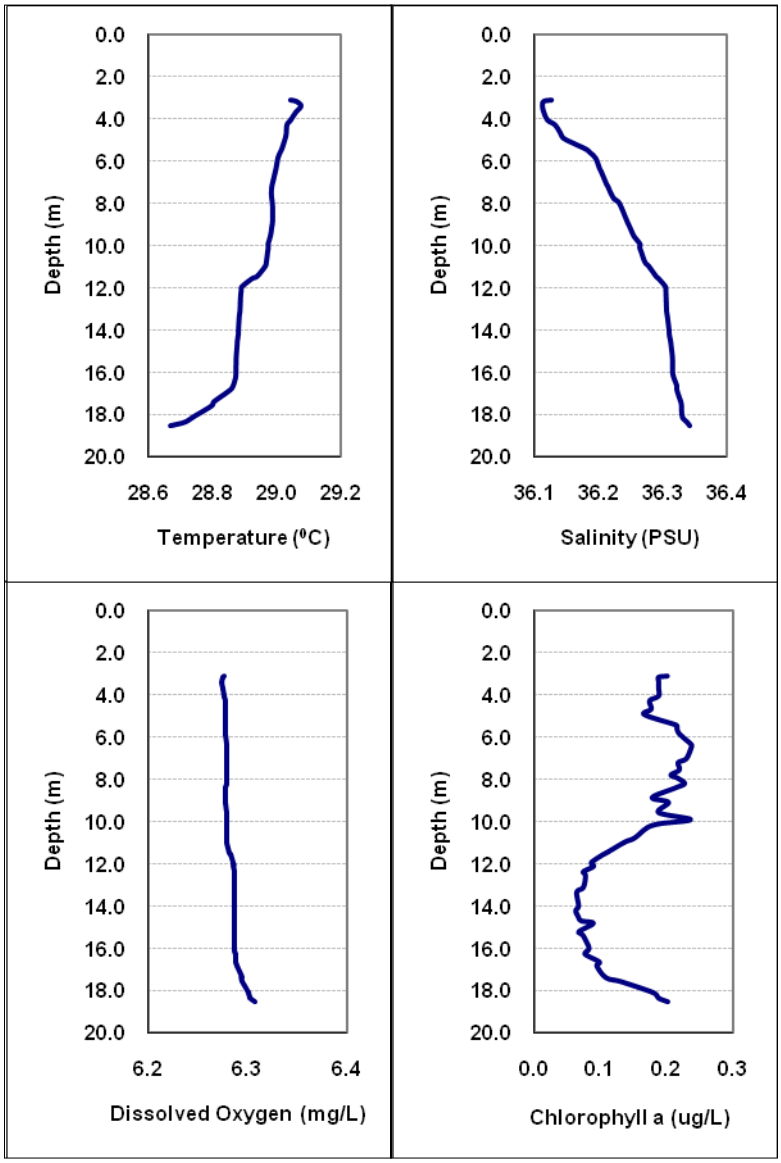

Figure 113: Boynton-Delray water quality monitoring CTD cast at station BD-3 July 2008.

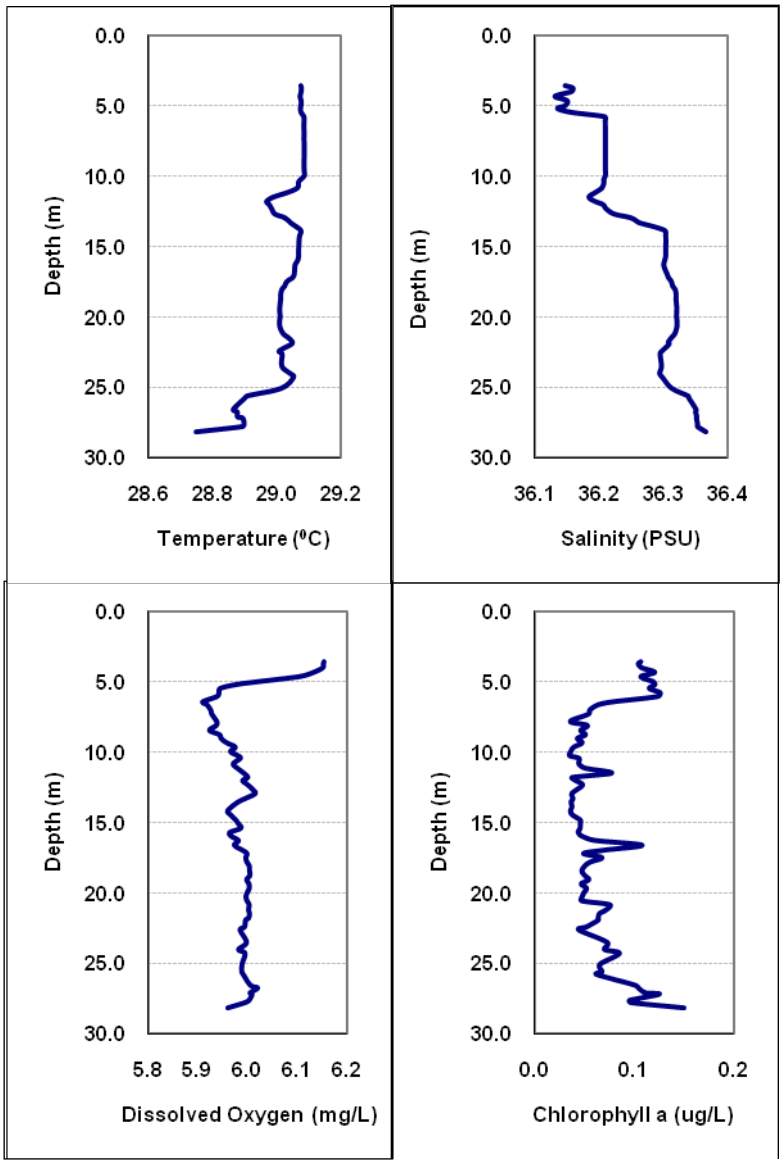

Figure 114: Boynton-Delray water quality monitoring CTD cast at station BD-4 July 2008.

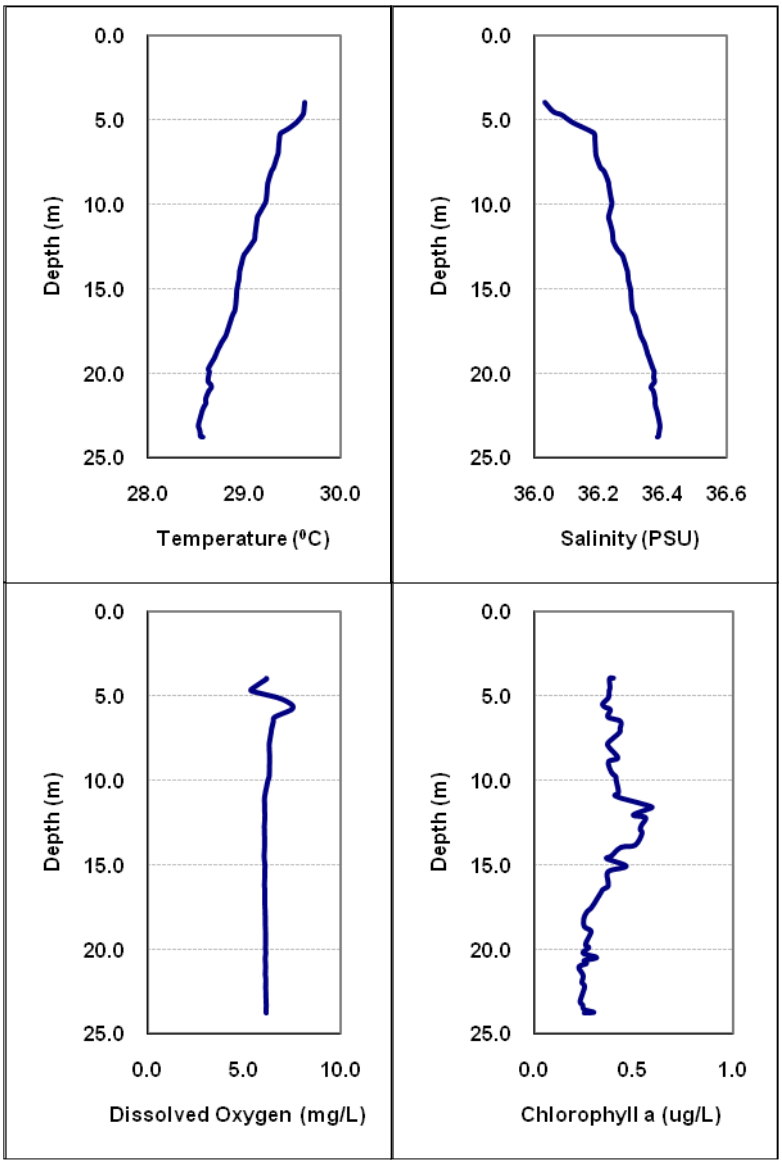

Figure 115: Boynton-Delray water quality monitoring CTD cast at station BD-5 July 2008.

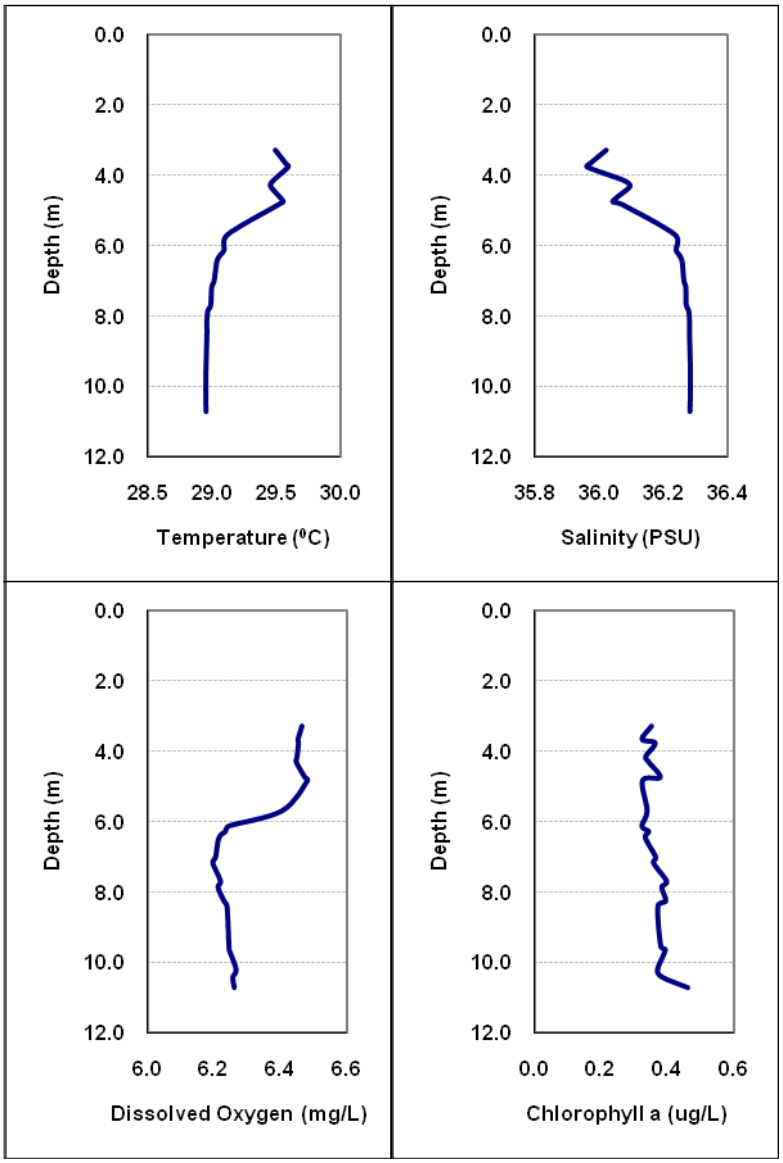

Figure 116: Boynton-Delray water quality monitoring CTD cast at station BD-6 July 2008.

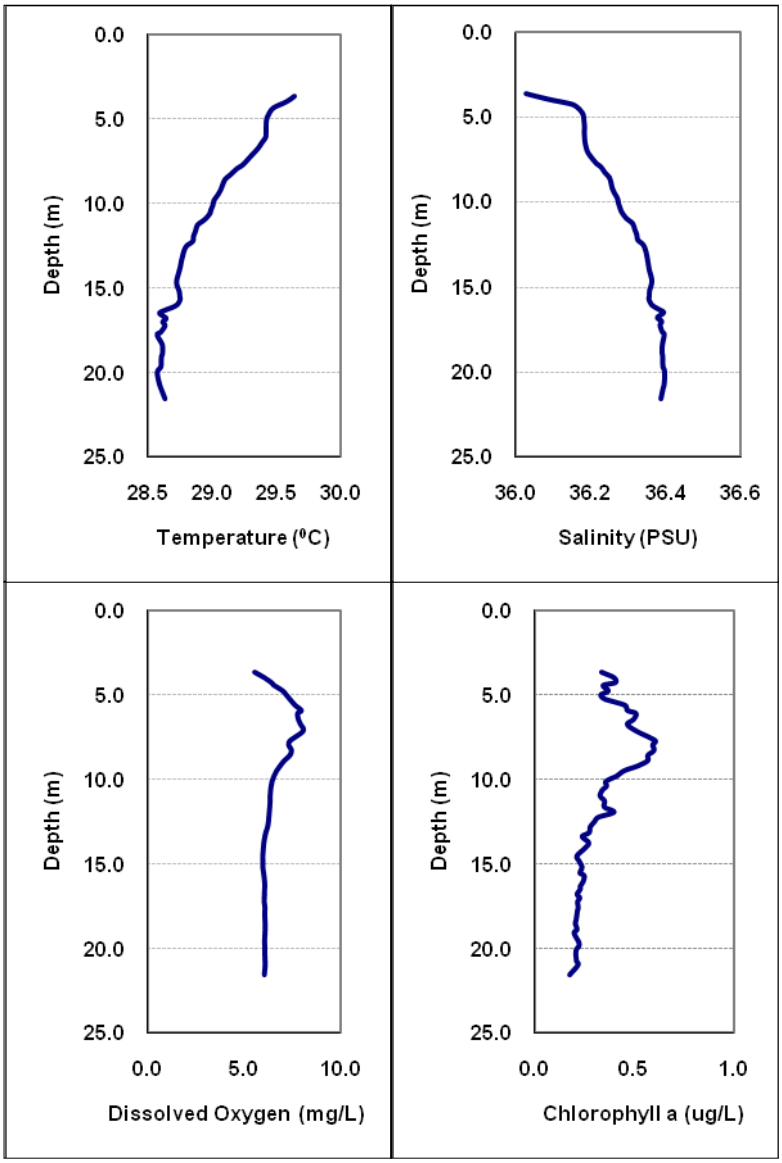

Figure 117: Boynton-Delray water quality monitoring CTD cast at station BD-7 July 2008.

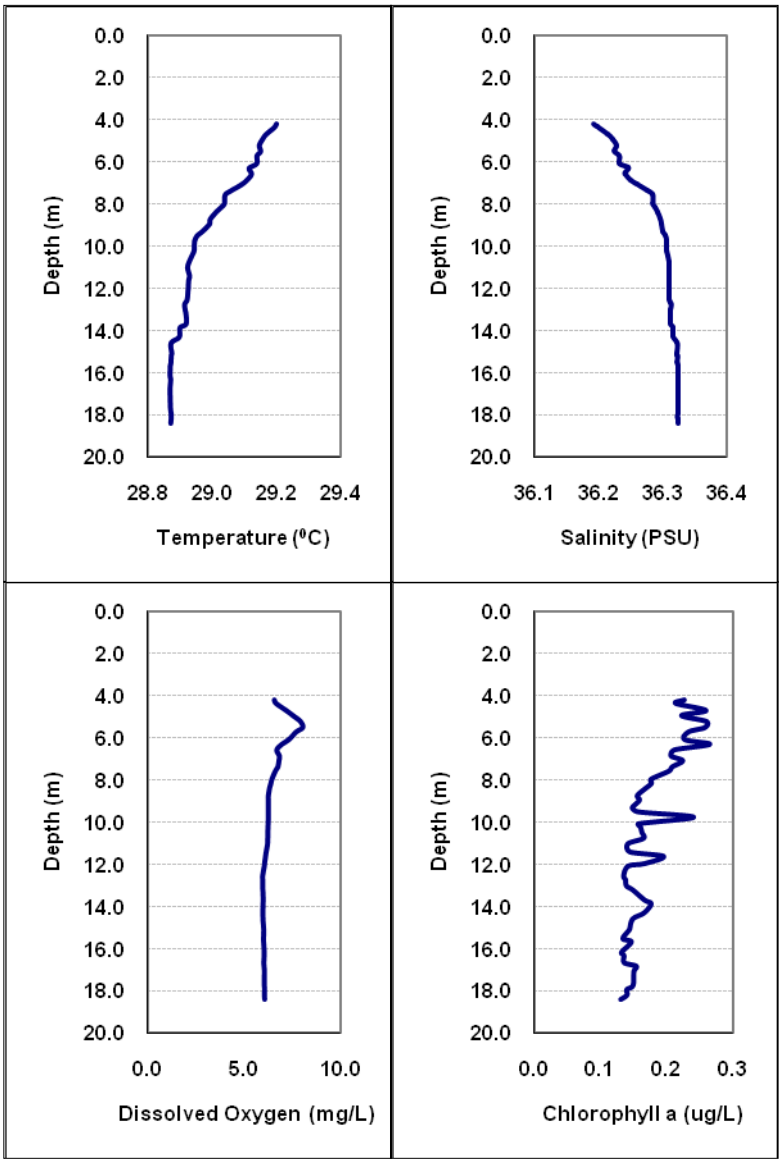

Figure 118: Boynton-Delray water quality monitoring CTD cast at station BD-8 July 2008.

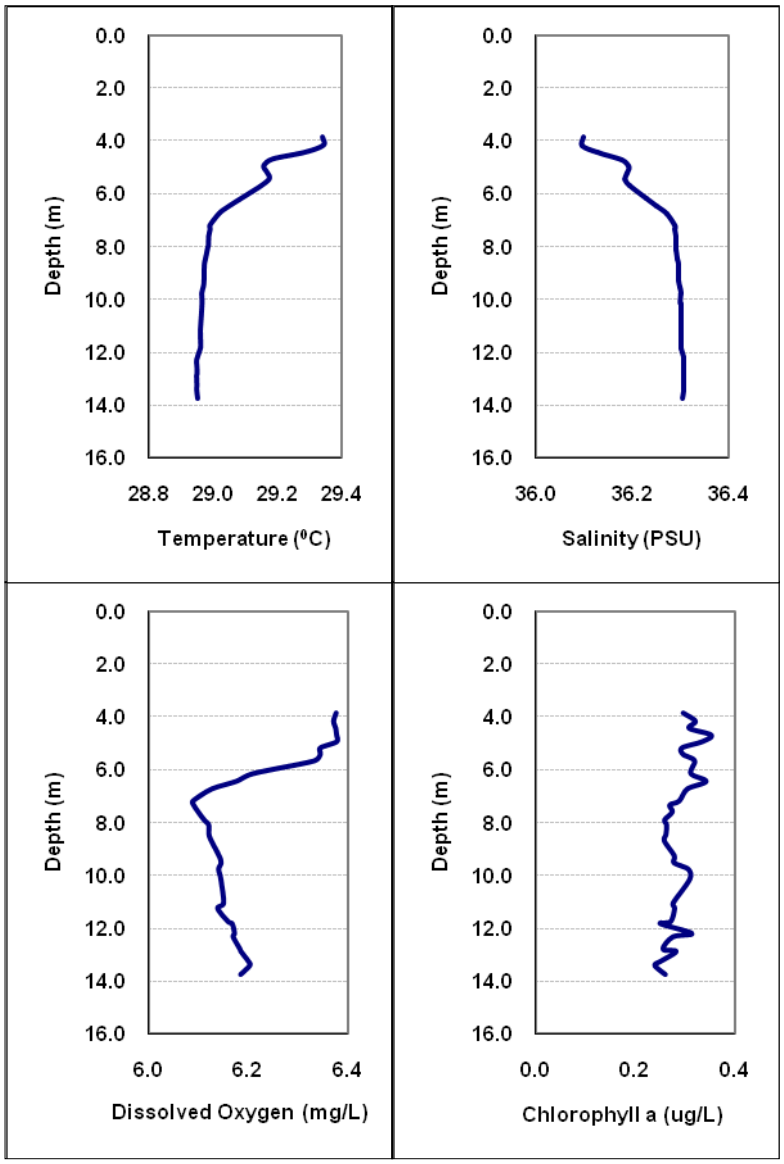

Figure 119: Boynton-Delray water quality monitoring CTD cast at station BD-9 July 2008.

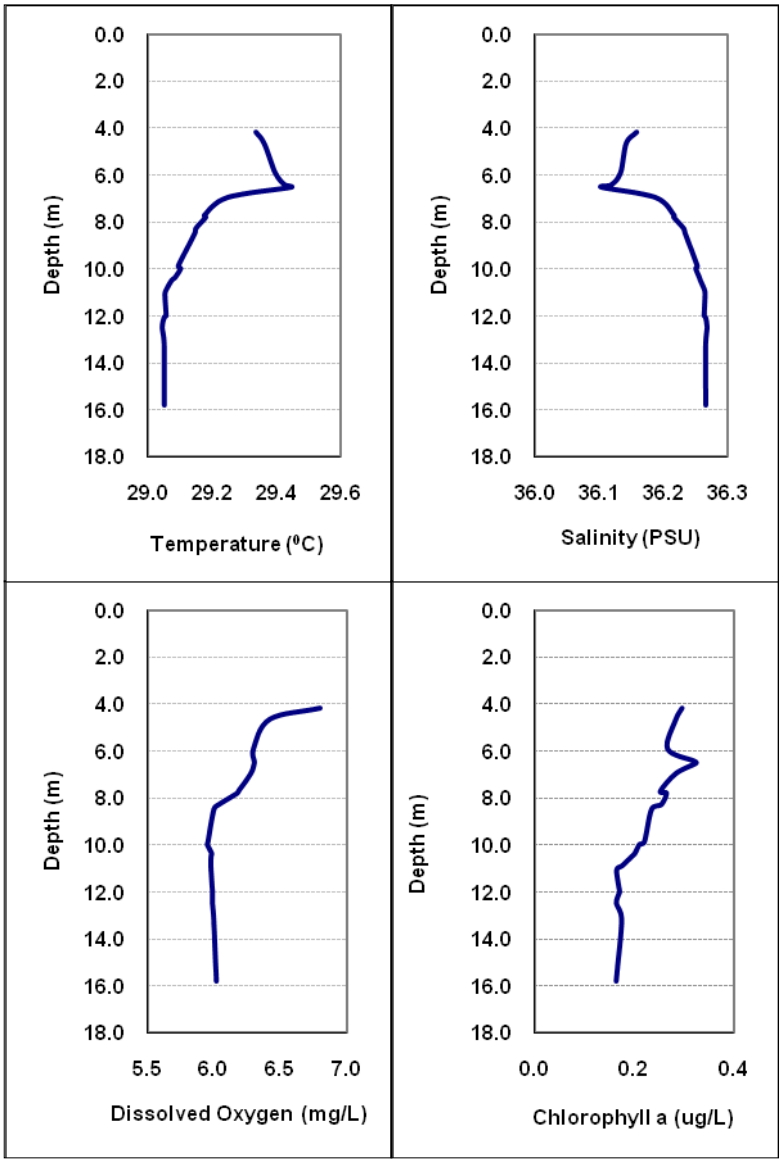

Figure 120: Boynton-Delray water quality monitoring CTD cast at station BD-10 July 2008.

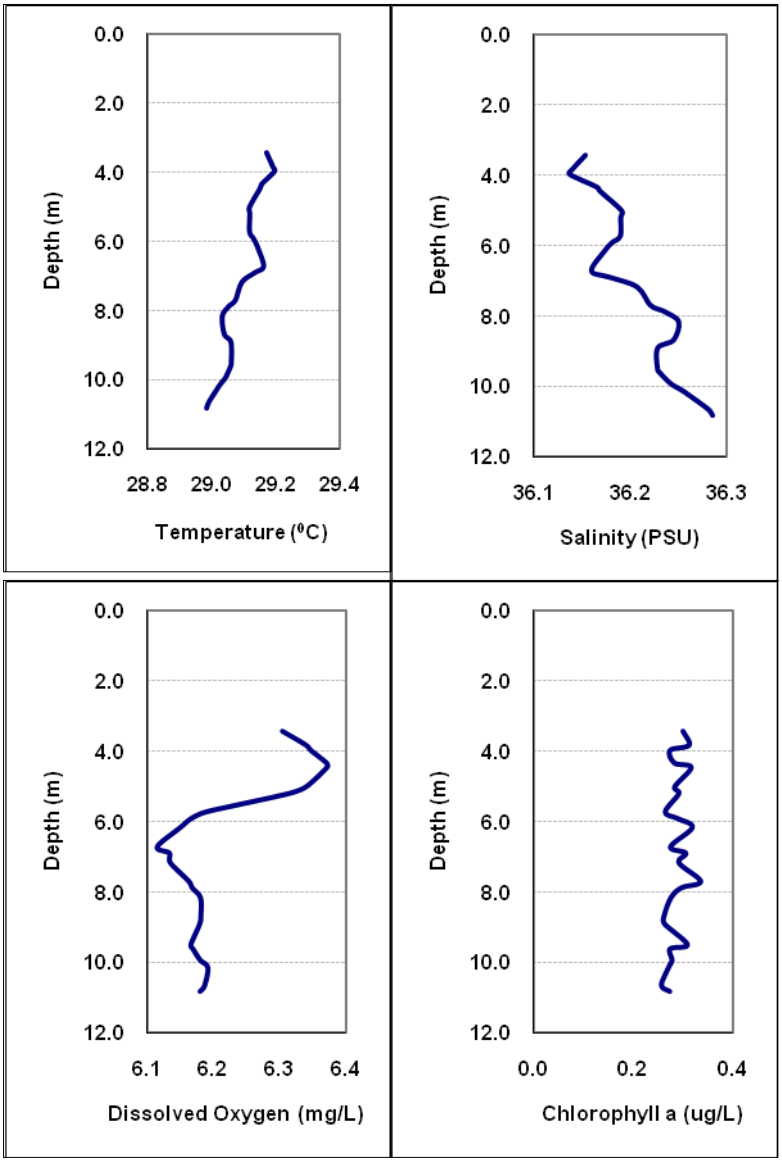

Figure 121: Boynton-Delray water quality monitoring CTD cast at station BD-11 July 2008.

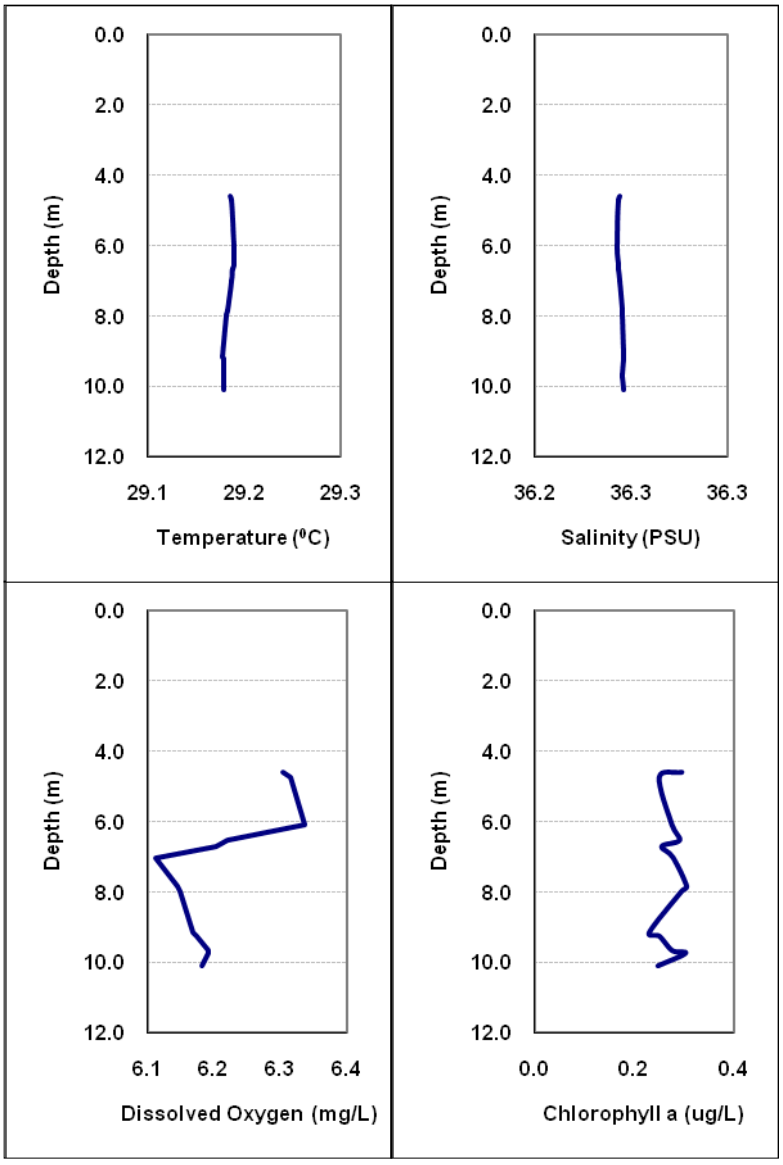

Figure 122: Boynton-Delray water quality monitoring CTD cast at station BD-12 July 2008.

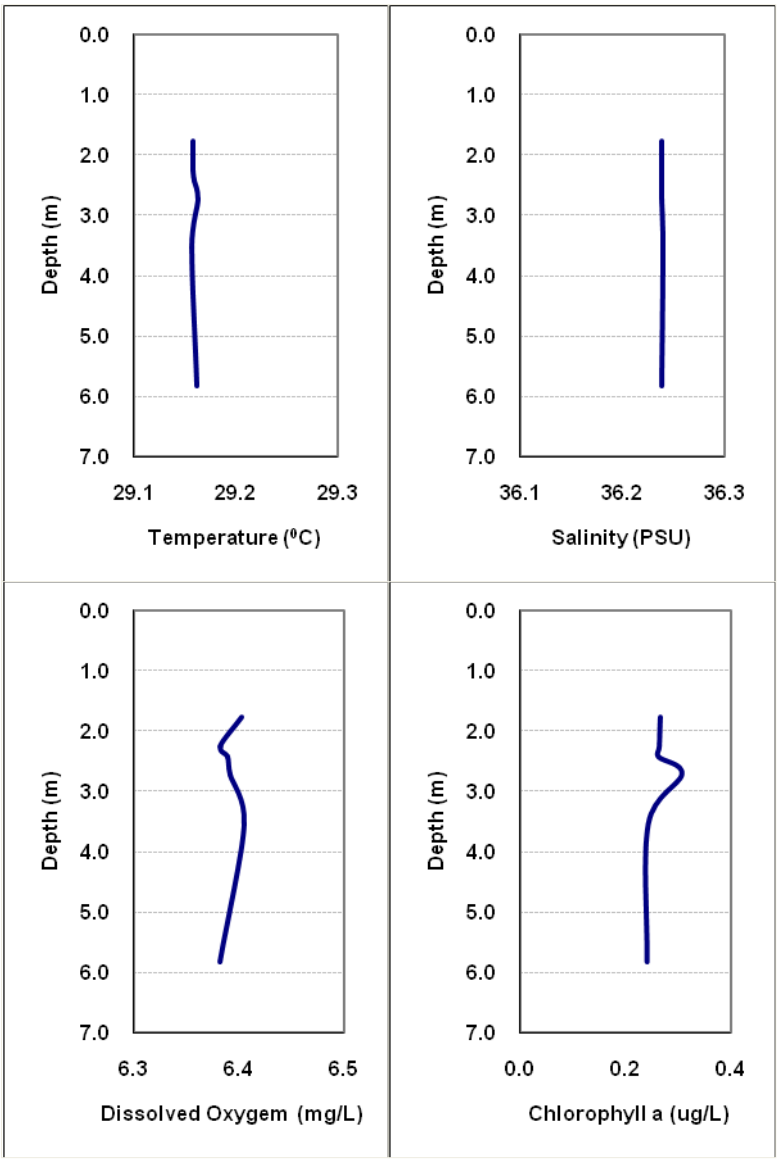

Figure 123: Boynton-Delray water quality monitoring CTD cast at station BD-14 July 2008.

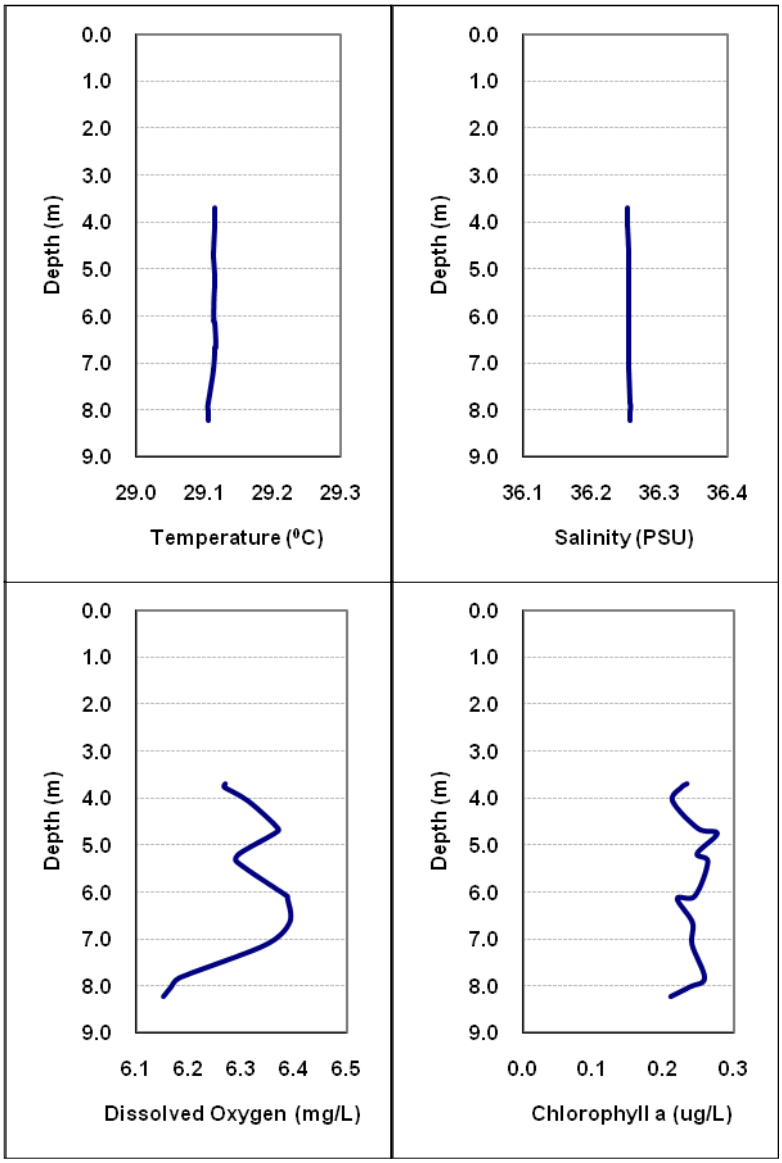

Figure 124: Boynton-Delray water quality monitoring CTD cast at station BD-15 July 2008.

9.7 CHEMICAL AND PHYSICAL DATA SUMMARY

This section will provide a brief overview of the physical and chemical oceanographic data obtained during the six sampling cruises.

9.7.1 Nutrient concentrations around the outfall

A central question concerns the fate of nutrients in the outfall effluent; in particular, how rapid is the dilution of nutrients until the concentrations are indistinguishable from ambient (e.g., unaffected) coastal waters. There is a qualitative nature to the discussion, as defining a 'background' or unaffected concentration is not straightforward in a region exposed to a number of nutrient sources. Nevertheless, we posit that a comparison of the concentrations north (down-current) of the outfall with those south of the outfall (up-current) is trenchant; i.e., if the outfall has an effect, it should be apparent in the former data when compared to the latter. In Figures 125-128 below, we have plotted the surface, mid, and bottom sample results for specific analytes for each monitoring cruise, versus distance from the outfall (north being positive). The bottom panel in each figure presents the results averaged over the six sampling cruises. Results from the outfall site (at zero distance) show the expected significantly elevated concentrations in the surface sample analyses (but much less elevated in the mid or bottom). For N+N, NH_4, and P, there was a rapid decrease in the surface concentrations and zero or minimal increase in the mid and bottom sample concentrations, with no discernable effect >3km from the outfall. For silicate (Figure 128), there was strong evidence for downward mixing down-current of the plume which persists over the 5.5 km of this study.

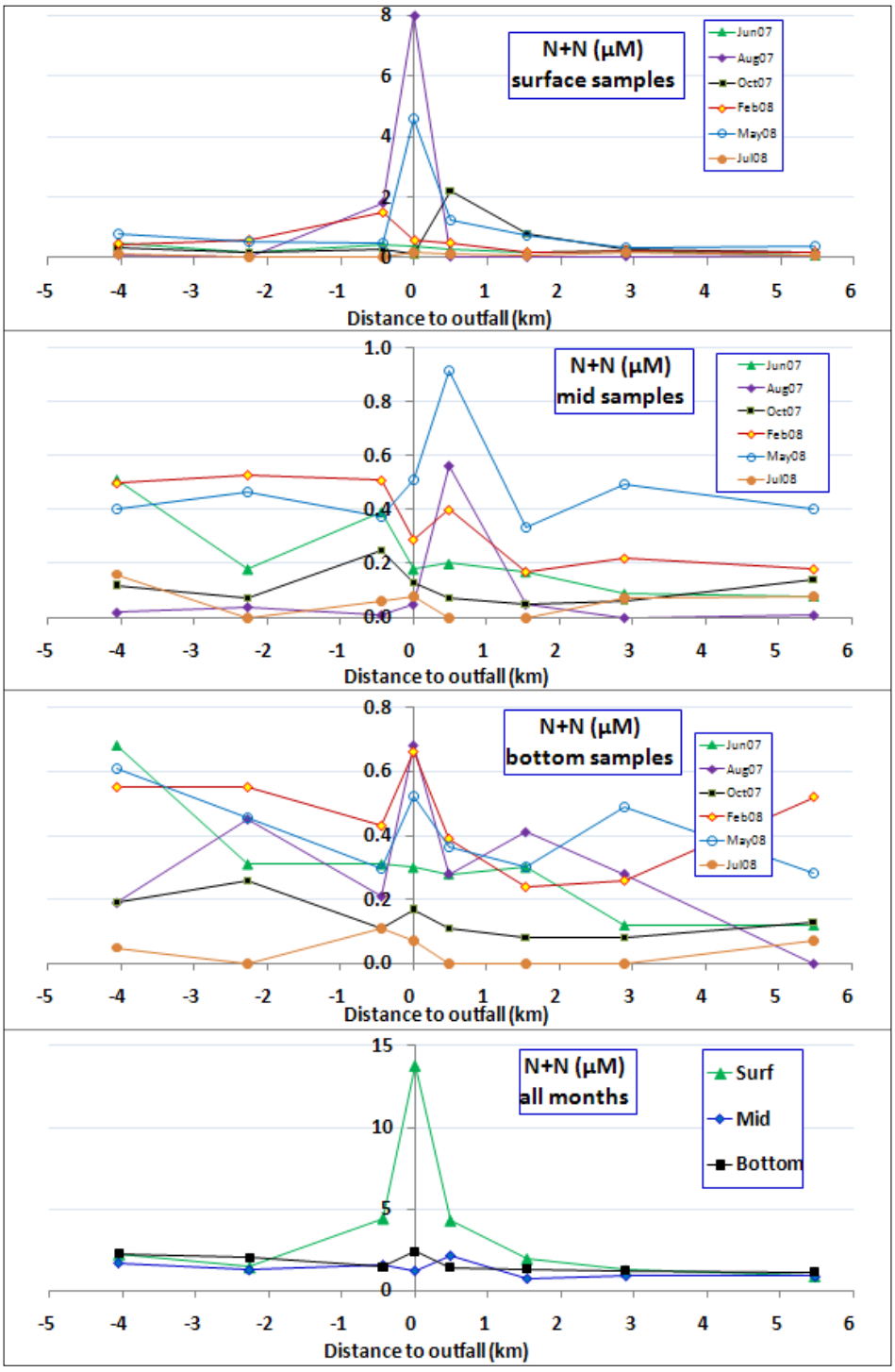

Figure 125. N+N concentrations from sampling sites 1-8 for surface (top panel), mid (second from top, and bottom samples (third from top); the averaged values (over all months) is shown in the bottom panel. Horizontal axis is the distance (in km) of each site from the outfall.

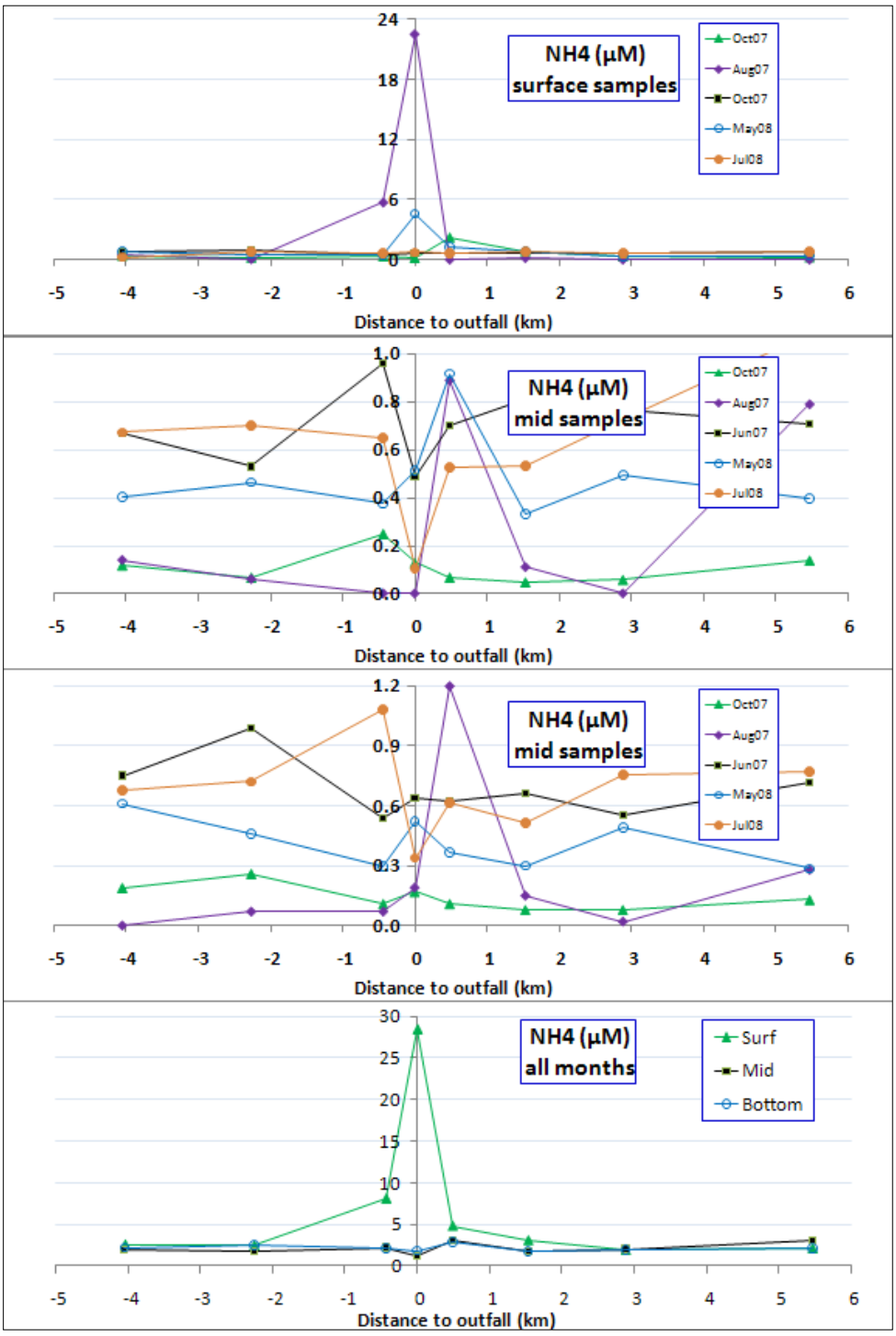

Figure 126. Ammonium concentrations from sampling sites 1-8. Format is the same as in Figure 125. Ammonium was not measured in February 2008 due to a lack of instrument availability.

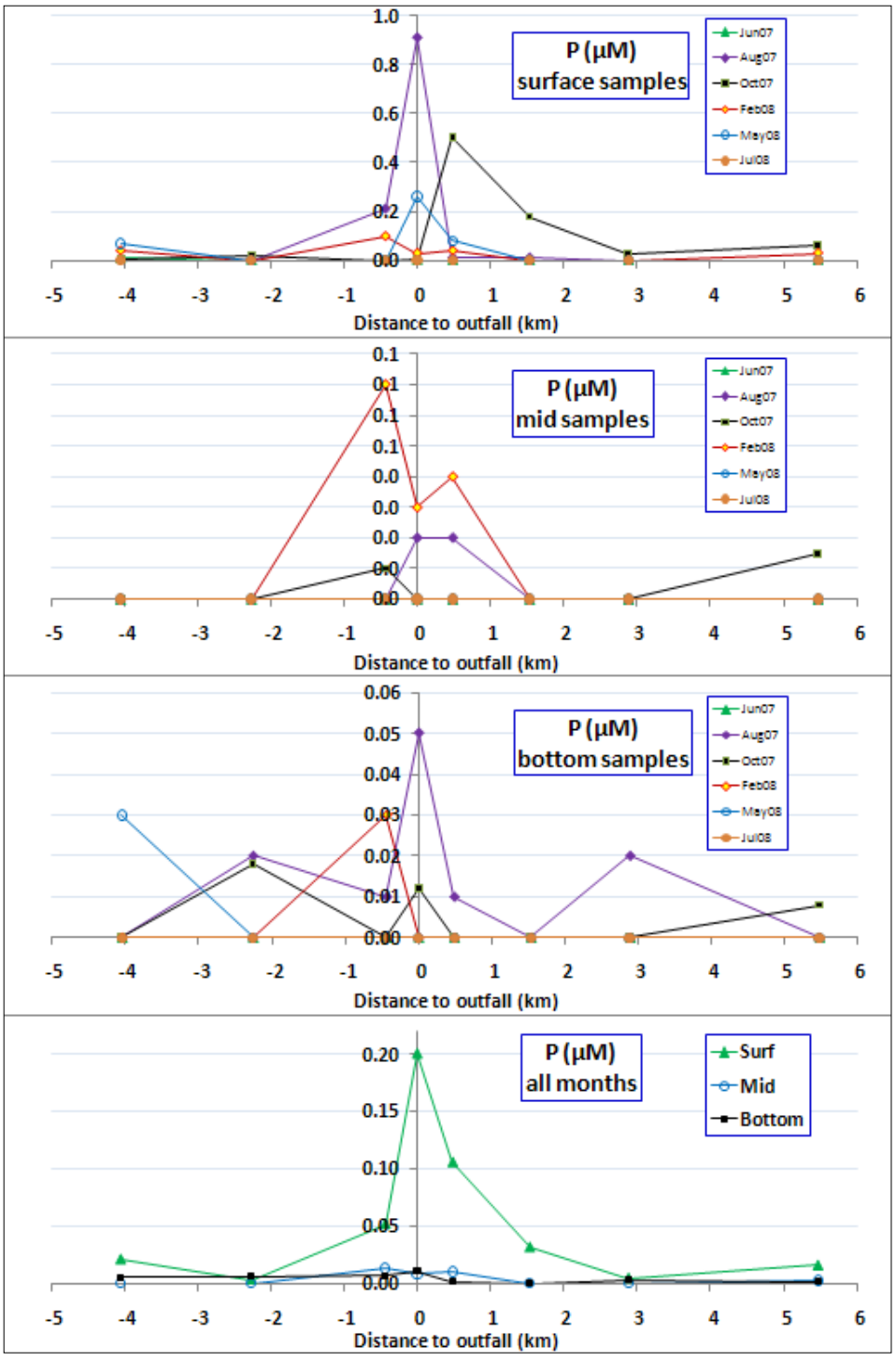

Figure 127. Ortho-phosphate concentrations from sampling sites 1-8. Format is the same as in Figure 125.

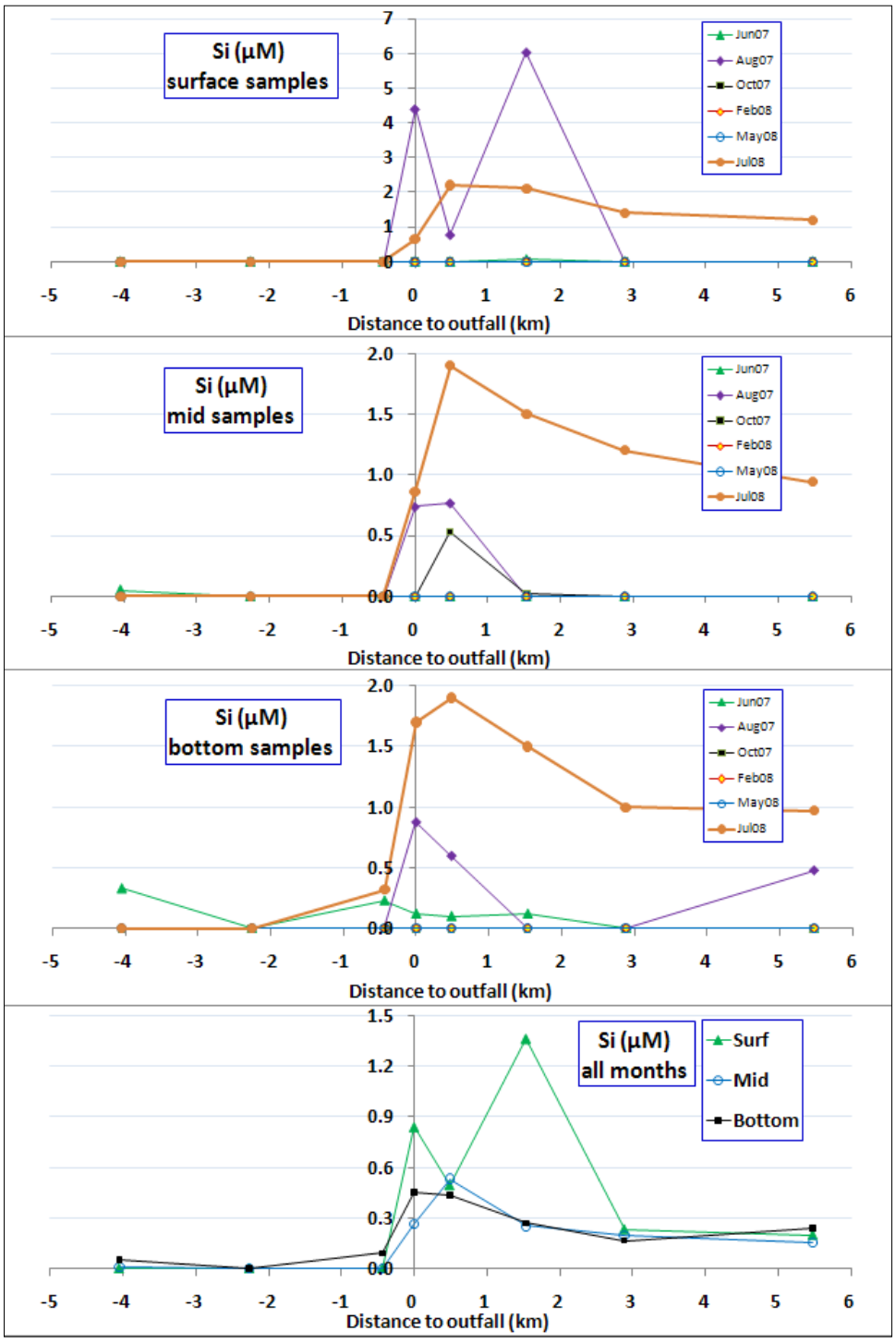

Figure 128. Silicate concentrations from sampling sites 1-8. Format is the same as in Figure 125. In the July 2008 samples (and to a smaller degree, August 2007), elevated silicate concentration were observed down-current from the outfall at all three depths.

A second analysis considers downward flux of nutrients from the boil. In Figure 129, we have plotted the surface, mid, and bottom sample results averaged over all six cruises. Recall BD 2 and 3 are up-current of the boil and thus represent the water column concentrations without impact from the outfall. Sample 4 attempted to sample boil; we see that the elevated concentrations are observed in the surface samples only. In the subsequent samples (5 to 8), where downward flux of the nutrients would be reflected in increased concentrations in the mid and bottom samples concomitant with decreases in the surface concentrations; however, it is observed that for N+N, P, and NH_4, minimal increases are seen in the latter depths as the surface concentrations decrease. For silicate, there is evidence for downward mixing, although again the more distant samples (i.e., #7 and 8) appear to be near that of the unaffected samples.

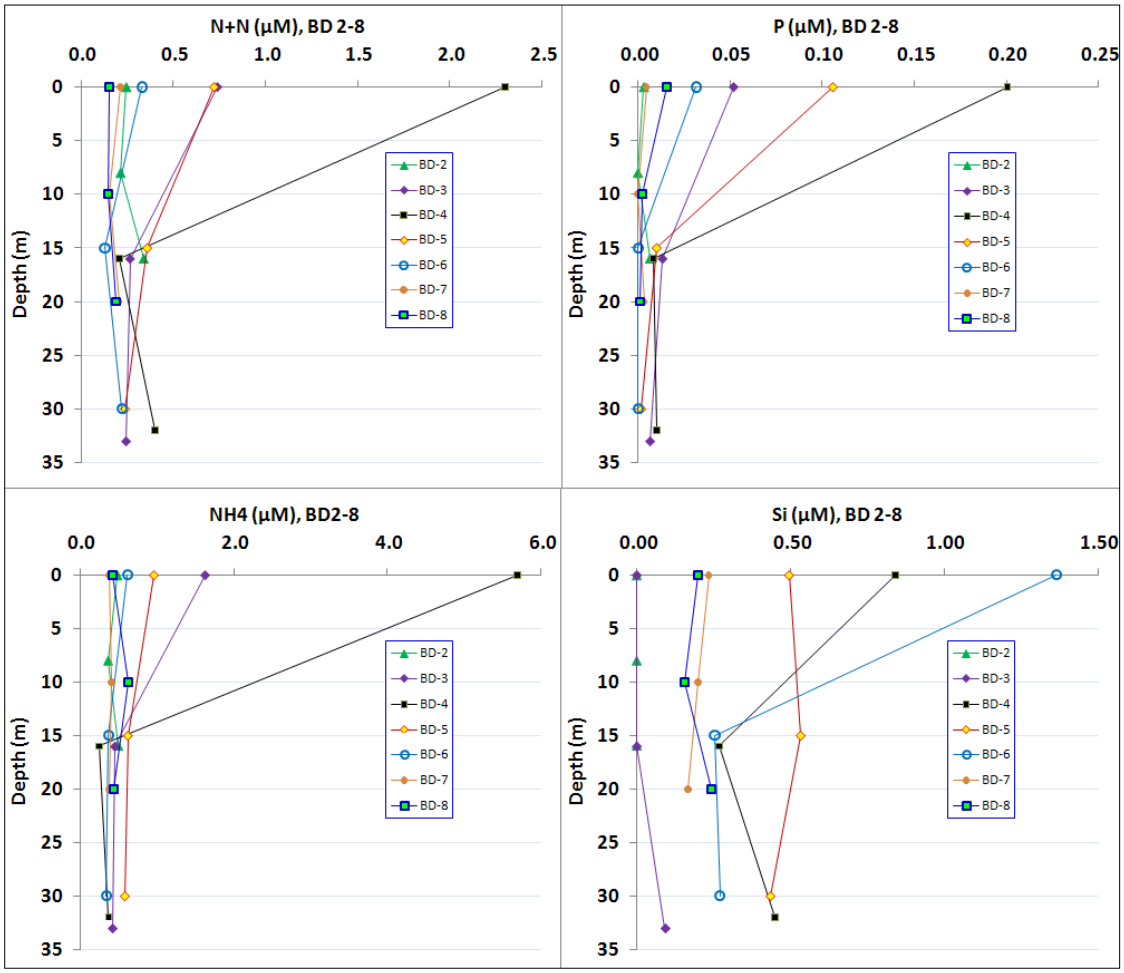

Figure 129. Each point represents the average of data from the six monitoring cruises, for the specified analyte and from the sampling sites indicated, plotted versus sampling depth. Locations BD2 and BD3 are south (up-current) of the outfall (BD4), the other sites are sequentially more northerly (down-current) of the outfall.

9.7.1 Seasonal variations

In this part of Florida, winds are generally from the east year around but weakest during the summer months (Henry *et al*., 1994, pp 77-79). In winter, winds from the north may dominate and produce storms. These conditions result in a more mixed (less stratified) coastal ocean during winter. This can be seen in the data in this report, e.g., the thermocline was not evident in most CTD casts during the February cruise.

In general, precipitation is highest during summer (June through September). During the time of this experiment (October 2007 through July 2008), precipitation was somewhat atypical. A plot of rainfall during this period is given in Figure 130. October of 2007 was unusually wet. The subsequent months (November through January) were dryer than normal, while the later winter (February through April) was wetter. Notably, May and June were dryer.

Precipitation would clearly affect the Lake Worth Lagoon and Boynton Inlet most directly. In Figure 131 are plotted the concentration of four nutrients (averaged over the three sampling depths) across time (sampling month) and grouped into geographic regions south to north. We first note that N+N and Si concentrations in the Lagoon (and less so in the inlet) closely parallel the rainfall shown in Figure 130. Input into the lagoon is, of course, a function of many factors besides rain, e.g., canal flow. In general, season variations in the nutrient concentrations are likely to be a result of complex changes in a variety of factors to numerous to elucidate in this document. Recall that for most samples, the ocean current was flowing northward when the CTD was cast.

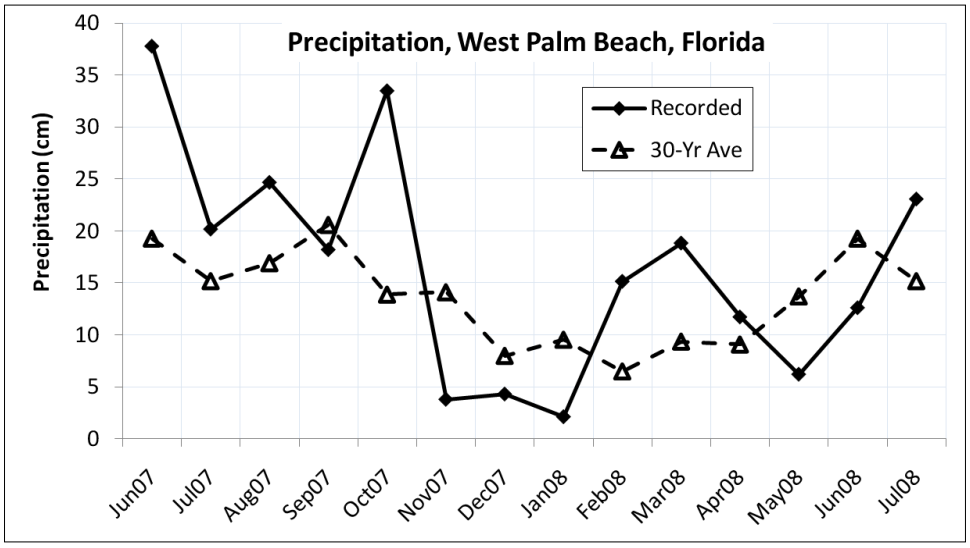

Figure 130: Rainfall measured at West Palm Beach, Florida. Solid: measured values; dotted: 30-year average. All data from NOAA NCDC (www.nodc.noaa.gov).

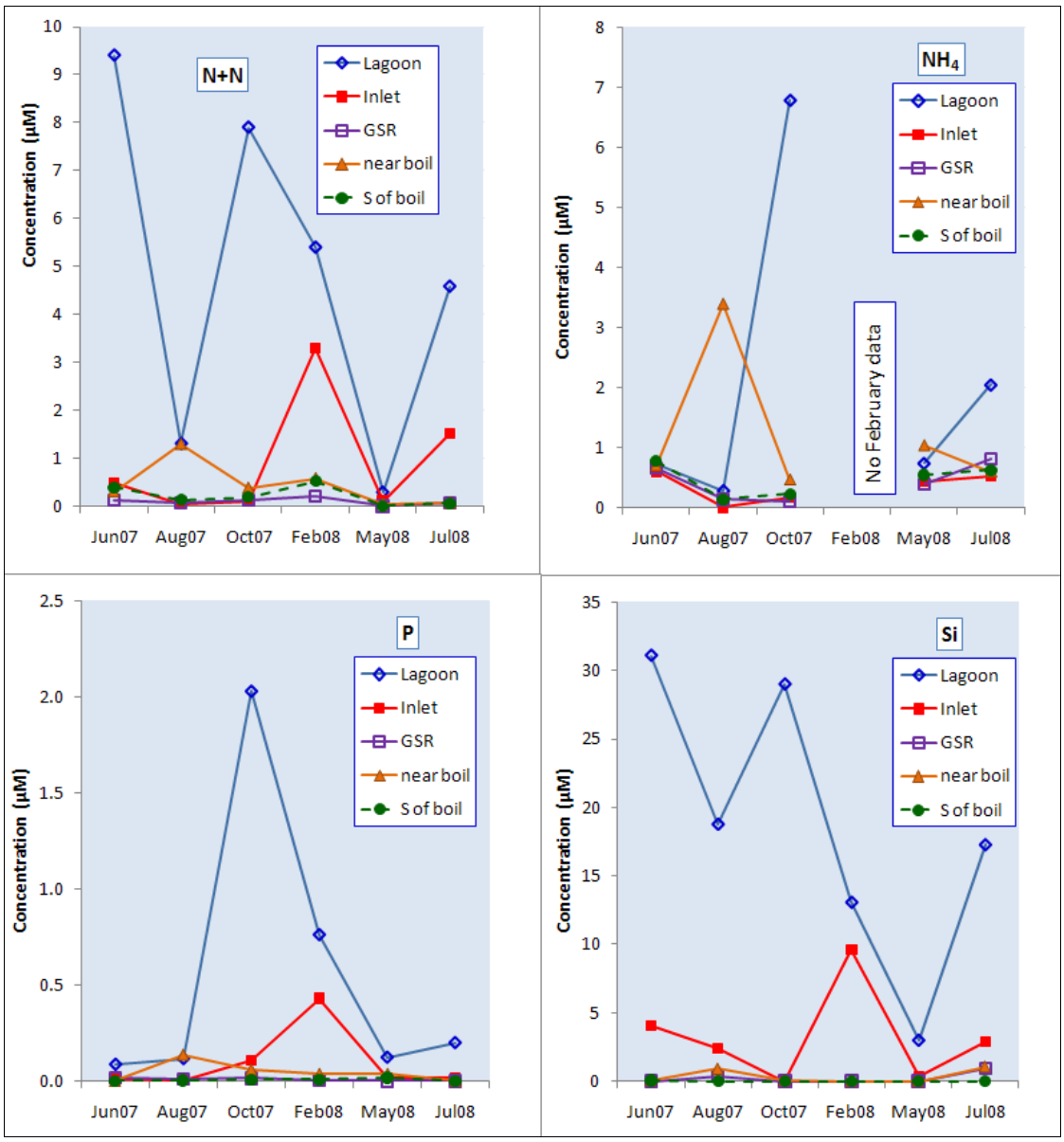

Figure 131. Concentrations of four nutrients, averaged over depth, and grouped into five categories, plotted per sampling month. Categories are as follows: S of boil: sites 1 and 2; Near boil: sites 3-5; GSR: sites 7-10; Inlet: samples 12-14; Lagoon: samples 16-18. There was no ammonium data set from the February 2008 cruise.

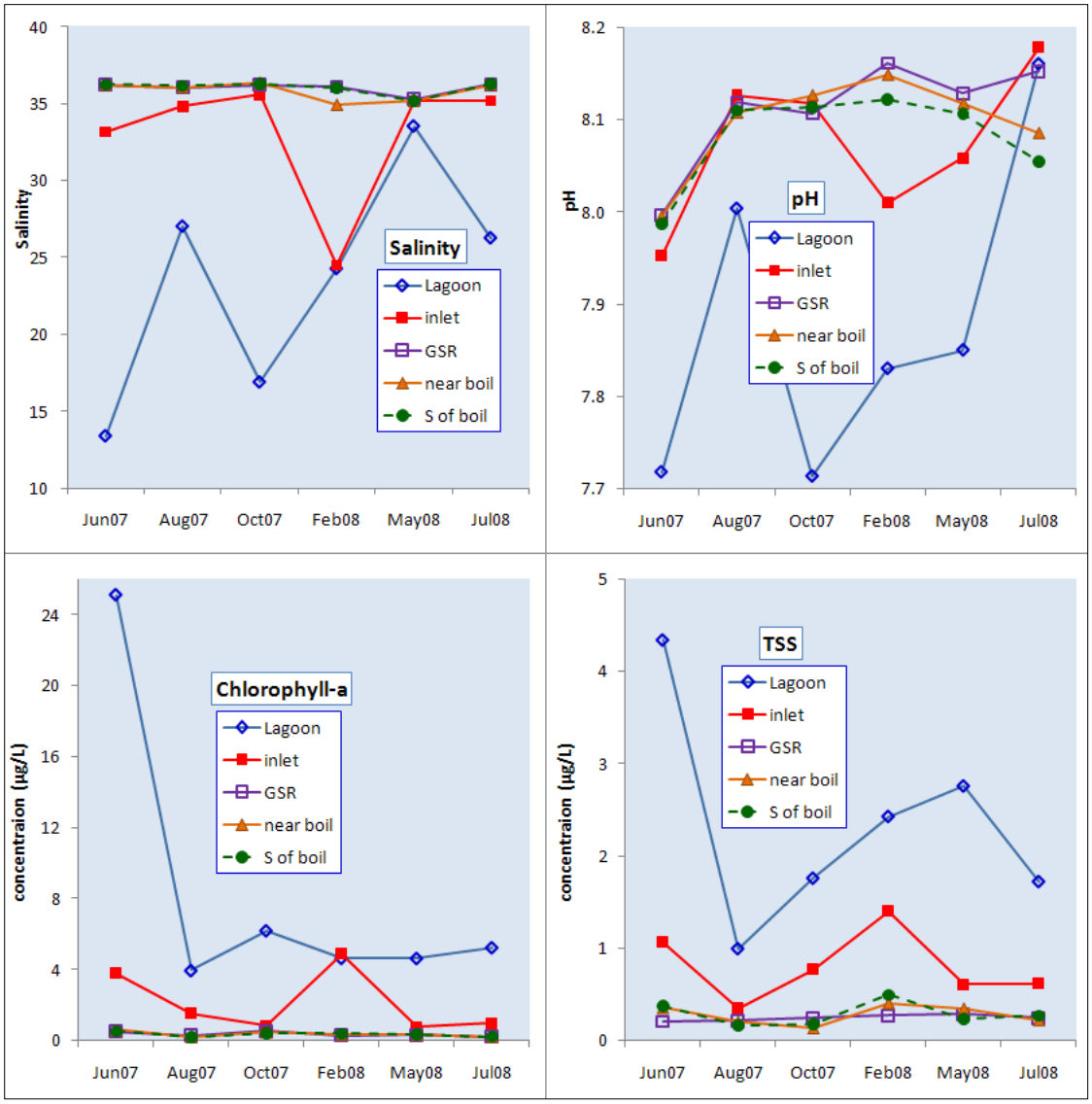

Figure 132. Measurements of salinity, pH, total suspended solids, and chlorophyll-a, plotted as in Figure 131.

The concentrations in the lagoon in Figures 131 and 132 nearly always exceeded the concentrations in the inlet and coastal ocean, another indication of rapid dilution of the plume. For N+N, Si, and P, the lagoon concentrations were the highest of all the categories of samples; the importance of the lagoon as a nutrient source to the coastal ocean is again reinforced. For ammonium, the boil concentrations (or south of the boil for June 2007) were highest, indicating the importance of the outfall as a source. As has been noted elsewhere (e.g., Carsey et al. 2010), the ammonium concentration rapidly decreased away from the boil.

The lagoon always had a lower pH (i.e., was more acidic) than all other sites except in Jul08, where the lagoon and the inlet had about the same pH as the GSR sites, while the

near boil and south of boil were somewhat lower in pH. Similarly, the lagoon had significantly lower salinity than all other sites (as expected), with the inlet intermediate between the lagoon and the coastal ocean, again as expected. Measurements of salinity and pH from the other sites were at or near open ocean values (salinity 34-35 psu, pH ~8, Segar 1998). The results for chlorophyll-a and total suspended solids was the reverse of that of pH and salinity, with the lagoon and (to a lesser degree) the inlet was higher in concentration than the coastal ocean locations. In these data, the boil measurements were at or very near the values from the other coastal sites. The anomalous lagoon data set may be June of 2007, which had elevated N+N, Si, Chlorophyll-a, and TSS, and low salinity and pH, but not P or NH_4. This was the month of the highest rainfall (Figure 130). October of 2007 was almost as wet, and had elevated P, N+N, NH_4, Si, but not chlorophyll-a or TSS. A complete understanding of the trends will have to incorporate additional data not available at this time.

We may roughly estimate the flux of nutrient mass from the Boynton Inlet into the coastal ocean by assuming the concentrations measured at Station 13 represent the nutrient concentration during that ebb tide flow. The outgoing (ebb) flow through the inlet was measured in a companion project to be about 7.4E+06 L/day with a Sontek 500-kHz side looking Doppler Sonar installed on the north side of the inlet on February 2007 and maintained for more than one year. (J. Stamates, unpublished results). We average over the six measurements and employ the average daily water flow through the inlet to generate Table 30.

Table 30. Estimates of flux from the Boynton Inlet.

Day	6-Jun	28-Aug	18-Oct	18-Feb	19-May	13-Jul	Ave Conc	Ave
Hour	15:00	16:00	9:00	9:30	21:36	9:22	µM	kg/day
N+N (µM)	2.25	0.08	1.40	3.30	0.48	9.00	3.02	314
Si (µM)	22.00	9.60	0.00	9.60	2.00	13.40	11.32	2,359
P (µM)	0.05	0.02	0.42	0.43	0.11	0.10	0.14	33
NH4 (µM)	0.48	0.00	0.64		0.60	1.18	0.57	59
TDN (µM)		9.46	9.59	19.72	10.83	17.98	14.50	1,506
DOC (µM)		115.22	82.43	219.37	112.64	176.54	155.94	13,885
TSS (mg/L)	3.72	0.52	1.83	1.40	1.93	2.06	1.91	14,172

Finally, we consider a rough estimate of a 'minimally affected ('background') concentrations for various analytes in the coastal ocean. Of course, this area is influenced by a number of nutrient sources, including the outfalls, the inlets, oceanic upwelling, ground water seepage, and atmospheric deposition. However, in the measurements reported in this document, we consider that the lowest concentrations of most analytes are from sites 7-10, e.g., between the inlet and the outfall and over the Gulf Stream Reef. Thus, we may propose these measurements to provide a basis for a discussion of 'background' concentrations. To that end, Table 31 provides the average concentrations, averaged over depths, of various analytes from those sites for each cruise and the overall average.

Table 31. Averaged concentrations from sites 7-10

	Jun07	Aug07	Oct07	Feb08	May08	Jul08	Ave
N+N (μM)	0.13	0.08	0.13	0.22	0.00	0.07	0.10
NH_4(μM)	0.66	0.13	0.10	0.00	0.39	0.81	0.35
P (μM)	0.02	0.01	0.01	0.00	0.00	0.00	0.01
Si (μM)	0.00	0.37	0.00	0.00	0.00	0.95	0.22
Salinity	36.23	36.07	36.24	36.12	35.31	36.27	36.04
Chl-a(μg/L)	0.49	0.28	0.54	0.28	0.30	0.22	0.35
pH	8.00	8.12	8.11	8.16	8.13	8.15	8.11
TSS(mg/L)	0.20	0.22	0.25	0.27	0.29	0.24	0.24

10.0 MICROBIOLOGICAL ANALYSES

During each sampling event a total of 102-L of sample water was collected from stations BD-4A (surface boil), BD-5A (500 m North of surface boil) and BD-13A (Boynton Inlet). The water collected from BD-13A was collected on an outgoing tidal cycle. Water samples were analyzed for the following microbiological parameters: (1) fecal indicator bacteria, (2) presence of pathogenic bacteria, (3) pathogenic protozoans and (4) presence of human viruses.

10.1 Culture Analysis

Selective and differential media were used to analyze samples for viable enterococci, *Escherichia coli*, *Bacteroides* species, and *Staphylococcus aureus*. Viable enterococci were enumerated using two methods 1) membrane filtration with incubation on mEI agar according to EPA Method 1600 (EPA, 2002a) and 2) the EPA-approved Enterolert™ chromogenic substrate assay (IDEXX, Inc.). Viable *E. coli* were enumerated by membrane filtration and incubation on mTEC agar using EPA Method 1603 (EPA, 2002b). Viable *Bacteroides* spp. were enumerated by membrane filter method incubated on BBE agar under anaerobic conditions (Baums *et al.*, 2007). Viable *Staphylococcus aureus* were enumerated by membrane filtration method incubated on CHROMagar™ Staph Aureus (Goodwin *et al.*, submitted). Water samples (800 – 2,100 ml) processed by membrane filtration used 0.45-μm, cellulose nitrate membrane filters (Whatman).

10.2 Immunofluoresecent Analysis

Cryptosporidium oocysts and *Giardia* cysts were concentrated from 200 L samples as described above in section 6.5. The oocysts and cysts were recovered using the EPA-approved Filta-Max® system according to the manufacturer's instructions (IDEXX, Inc.). The Filta-Max wash station and sample concentration equipment was graciously supplied by H. Solo-Gabriele. The protists were enumerated by immunomagnetic separation and immunofluorescent microscopy according to EPA Method 1623 (EPA, 2001). Analysis was conducted by the NELAP-certified facilities of BSC Labs, Inc, Miami, FL.

10.3 Viral Analysis

Samples were collected, filtered, eluted and shipped on ice to the NOAA laboratory in Charleston, SC for analysis of enteric viruses. Briefly, 1.2 – 3 L of water were filtered through ViroCap positively charged aluminum fiber filters (Scientific Methods, Inc; Granger, IN). The viruses were then eluted using 2 mL Optima RE solution (Scientific Methods, Inc; Granger, IN) with addition of 0.01% Tween. The eluate was frozen and shipped, then thawed for extraction of viral RNA. Extraction followed either the CEFAS protocol (Lees et al., 2004) or the Qiagen MIDI extraction kit per manufacturer's instructions. Both protocols were performed on each sample for sake of comparison. Extracts were then analyzed for viruses using the reverse-transcriptase polymerase chain reaction (RT-PCR). Assays for detection of norovirus and enterovirus were performed as described in Jothikumar et al. (2005) and Gregory et al. (2006), respectively. Norovirus analysis included individual assays for genogroup I and genogroup II. The MS2 assay is currently unpublished. Given the lack of quantitative controls used for these assays, results were reported as presence or absence for each virus. The minimum detection limit for the MS2 assay was 5 genomes/reaction, and the detection limit for norovirus and enterovirus was 25 genomes/reaction.

In addition to that described above, norovirus and enterovirus were analyzed by qPCR at AOML using kits by Cepheid Inc. as described in Sinigalliano *et al.* (2007).

10.4 PCR Analysis

In general, 1.5 L of water was filtered onto 0.2-µm, Supor-200 filters (Pall Corporation) for the purposes of total DNA extraction. Crude DNA lysates were obtained from filters while onboard the ship by bead-beating (Haughland et al., 2005) in Qiagen AE buffer with a Qbiogene FastPrep bead beating instrument at speed 6.5 for a total of 40 s. The lysates were diluted 1:5 with fresh AE buffer and stored at -80˚C until analysis.

An aliquot (5 µL) of each 1:5 dilution was utilized as template DNA in 50 µL PCR reactions according to the following: 5 µL Finzyme 10X buffer, 1.25 µL dNTPs (10 mM), 1.5 µL BSA (10 mg/mL), 2.5 µL forward primer (10 µM), 2.5 µL reverse primer (10 µM), 0.75 µL Finzyme, Hotstart Taq Polymerase. Cycling conditions were as follows: 94˚C denaturation for 10min; 30 cycles of 94˚C 30s, 58˚C 30s, 72˚C 30s; followed by a 70˚C extension for 8min; hold at 4˚C.

The lysates were analyzed for the presence of the following fecal indicators, pathogens, and markers of fecal pollution, as described in LaGier et al. (2007):

- enterococci (23S rRNA gene)
- human-specific enterococci (*esp* gene)
- *Campylobacter jejuni* (*hipO* gene)
- *Salmonella* spp. (IpaB gene)
- *E. coli* strain 0157:H7 (*rfb* gene)
- *Staphylococcus aureus* (*clfA* gene)
- human adenovirus (*Hexon* gene)

In addition to standard positive and negative control, samples also were tested for the presence of amplifiable DNA and for PCR inhibition using primers that amplify a universal region of the bacterial 16S rRNA gene (Unifor/Unirev primer set; Zheng *et al.*, 1996).

10.5 MICROBIOLOGICAL DATA SUMMARY

Viable enterococci varied between BDL to 21 MPN/100ml for the outfall boil, while all samples at BD-5A were <10MPN/100ml. Total enterococci varied between BDL to 35 GEU/100ml for the surface boil and from BDL to 9.6 GEU/100ml for BD-5A. There was no presence of the human-specific *Enterococus faecium* at either site during all sampling events. Viable bacteroides varied from 2 to 37 CFU/100ml at the outfall boil, while BD-5A had levels <1 to 7 CFU/100ml. Human-specific bacteroides (BacHum-UCD primers) varied from BDL to 215 GEU/100ml at the outfall boil and from BDL to 9.5 GEU/100ml at station BD-5A. Human-specific bacteroides (HF8 gene cluster) was BDL for the outfall boil and BD-5A during all sampling events. Norovirus was found to be present during 3 of the sampling events at the outfall boil site and not present at BD-5A. Enterovirus was found to be present during most sampling events for the outfall boil and only once for BD-5A (May 2008). Human Adenovirus was found to be present during half of the sampling events at the outfall boil and absent at BD-5A. Cryptosporidium oocysts varied from 2 to 10.7 cysts/100L at the outfall boil and from <1 to <2.1 cysts/100L at BD-5A. Giardia cysts varied from <1 to 72.1 cysts/100L at the outfall boil, while BD-5A varied from <1 to 2.1 cysts/100L. *Campylobacter jejuni* (HipO), *Salmonella sp*. (IpaB gene) and *E. coli* (strain 0157:H7 rfb gene) were found to be absent from both sites during all sampling events. Coagulase negative *Staphylococcus aureus* c1fA gene was found to be present at the outfall boil only during the May 2008 sampling, while no presence was found at BD-5A during all sampling events (Table 32).

Viable enterococci varied from <1 to 82 MPN/100ml at the Boynton Inlet site (BD-13A). Presence of human source Enterococci was found during the August 2007 and May 2008 sampling events at BD-13A. Presence of the human source Bacteroides HF8 was found during August 2007, October 2007 and May 2008 sampling events at the Boynton Inlet. Human source Bacteroides HuBac was found at BD-13A during all sampling events except June 2007 and February 2008. *Salmonella sp*., *E. coli* O157:H7 and

Campylobacter jejuni were not present at BD-13a during all sampling events. *Staphylococcus aureus* was present during half of the sampling events at BD-13A. Cryptosporidium oocysts and Giardia cysts varied from <1 to 24.9 cysts/100L at BD-13A. The presence of human viruses, Human Adenovirus, Norovirus and Enterovirus were found to be present at BD-13A during some of the sampling events (Table 33).

Table 32: Microbiological parameters analyzed during the Boynton-Delray WQM for Stations BD-4A & BD-5A (June 2007 - July 2008).

	Treated Wastewater Outfall Sample site →		**BD-4 June 2007**	**BD-5 June 2007**	**BD-4 August 2007**	**BD-5 August 2007**	**BD-4 Oct 2007**	**BD-5 Oct 2007**	**BD-4 Feb 2008 (Nancy Foster)**	**BD-5 Feb 2008 (Nancy Foster)**	**BD-4 May 2008**	**BD-5 May 2008**	**BD-4 July 2008 (Walton Smith)**	**BD-5 July 2008 (Walton Smith)**
Target Indicator or Pathogen ↓	**Method ↓**	**Units ↓**												
viable enterococci	Idexx EnteroLert™	MPN/100mL	<10	<10	<10	<10	<10	<10	<10	<10	21	<10	<10	<10
total enterococci (23S rRNA gene)	qPCR (Haugland et al 2005)	GEU/100mL	BDL	BDL	14.2	BDL	BDL	BDL	BDL	9.6	35	BDL	BDL	BDL
Human-specific *Enterococcus faecium* esp gene	PCR (Scott et al 2005)	presence or absence +/-	-	-	-	-	-	-	-	-	-	-	-	-
viable Bacteroides	membrane filtration plate counts on BBE agar	CFU/100mL	5	<1	37	7	2	<1	4	<1	<1	<1	2	<1
Human-specific Bacteroides (BacHum-UCD primers)	qPCR (Kildare et al 2007)	GEU/100mL	BDL	BDL	215	6.1	BDL	4.4	27.6	BDL	BDL	BDL	BDL	9.5
Human-specific Bacteroides (HF8 gene cluster)	qPCR (adapted from Bernhard & Field 2000)	GEU/100mL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
norovirus	qPCR (Cephied, Inc.)	presence or absence +/-	+	-	+	-	-	-	-	-	+	-	-	-
enterovirus	qPCR (Cephied, Inc.)	presence or absence +/-	-	-	+	-	+	-	N/A	N/A	+	+	+	-
Human Adenovirus hexon gene	PCR (He & Jiang 2005)	presence or absence +/-	+	-	-	-	+	-	-	-	-	-	+	-
Cryptosporidium oocysts	IMS/IMF (by Troy Scott, BSC labs)	cysts/100L	2	<2.1	10.7	<1	3.3	<1	DP	DP	5.6	<1	N/A	N/A
Giardia cysts	IMS/IMF (by Troy Scott, BSC labs)	cysts/100L	34.8	2.1	72.1	<1	<1	<1	DP	DP	30.2	2.1	N/A	N/A
Campylobacter jejuni HipO gene	PCR (LaGier et al 2004)	presence or absence +/-	-	-	-	-	-	-	-	-	-	-	-	-
Salmonella sp. IpaB gene	PCR (Kong et al 2005)	presence or absence +/-	-	-	-	-	-	-	-	-	-	-	-	-
coagulase negative *Staphylococcus aureus* clfA gene	PCR (Mason et al 2001)	presence or absence +/-	-	-	-	-	-	-	-	-	+	-	-	-
E. coli strain 0157:H7 rfb gene	PCR (Maurer et al 1999)	presence or absence +/-	-	-	-	-	-	-	-	-	-	-	-	-

Table 33: Microbiological parameters analyzed during the Boynton-Delray WQM for Station BD-13A (June 2007 - July 2008).

	Assay	June 07	Aug 07	Oct 07	Feb 08	May 08	July 08
Fecal Indicator Bacteria	**viable enterococci** by IDEXX EnteroLert, MPN/100 mL	**10**	**52**	**20**	**<1**	**82**	**<1**
	Presence of **Human-source Enterococci** by PCR (esp gene marker	-	+	-	-	+	-
	Presence of Human-source Bacteroides HF8 marker by PCR	-	+	+	-	+	-
	Presence of **Human-source Bacteroides** HuBac marker by PCR	-	+	+	-	+	+
Presence of Pathogenic Bacteria (by PCR)	**Salmonella sp**. (IpaB gene)	-	-	-	-	-	-
	E. coli O157:H7 (rfb gene)	-	-	-	-	-	-
	Campylobacter jejuni (HipO gene)	-	-	-	-	-	-
	Staphylococcus aureus (clfA gene)	-	+	-	-	+	+
Pathogenic Protozoans (by IMS/IMF)	**Cryptosporidium oocysts** (per 100 L)	6.3	24.9	3.1	<1	5.4	1.2
	Giardia cysts (per 100 L)	4.2	19.4	1.8	<1	12.3	5.1
Presence of Human viruses (by PCR)	**Human Adenovirus**	-	+	-	+	+	+
	Noroviruses	-	+	-	-	+	-
	Enteroviruses	-	+	+	-	-	-

11.0 Ocean Current and Wind Measurements

An acoustic Doppler current profiler (ADCP, Teledyne RD Instruments, Poway, CA) was installed at a location on the southern end of Gulfstream reef at 26° 29.272'N; 80° 02.35W, mounted on the bottom at a depth of 17 m (Figure 133). The instrument reports a current measurement every 20 minutes. Data from the six monitoring cruises is shown in figures 134a-139a. Four depths were selected to represent the water column. The data are presented as stick plots where true North is at the top of the page and East is clockwise to the right. The magnitude of the current is represented by the length of the sticks and scaled to the y axis (cm s^{-1}).

Figure 133: Photograph of the ADCP unit installed on the Gulf Steam Reef (south) and operational beginning 29 September 2006.

Wind data from the LKWF1 buoy at Lake Worth, Florida (26°36'42" N, 80°2'0" W) was used for the plots below (www.ndbc.noaa.gov/station_page.php?station=LKWF). In general, there is no correlation with winds and surface currents (Figures 133b-138b).

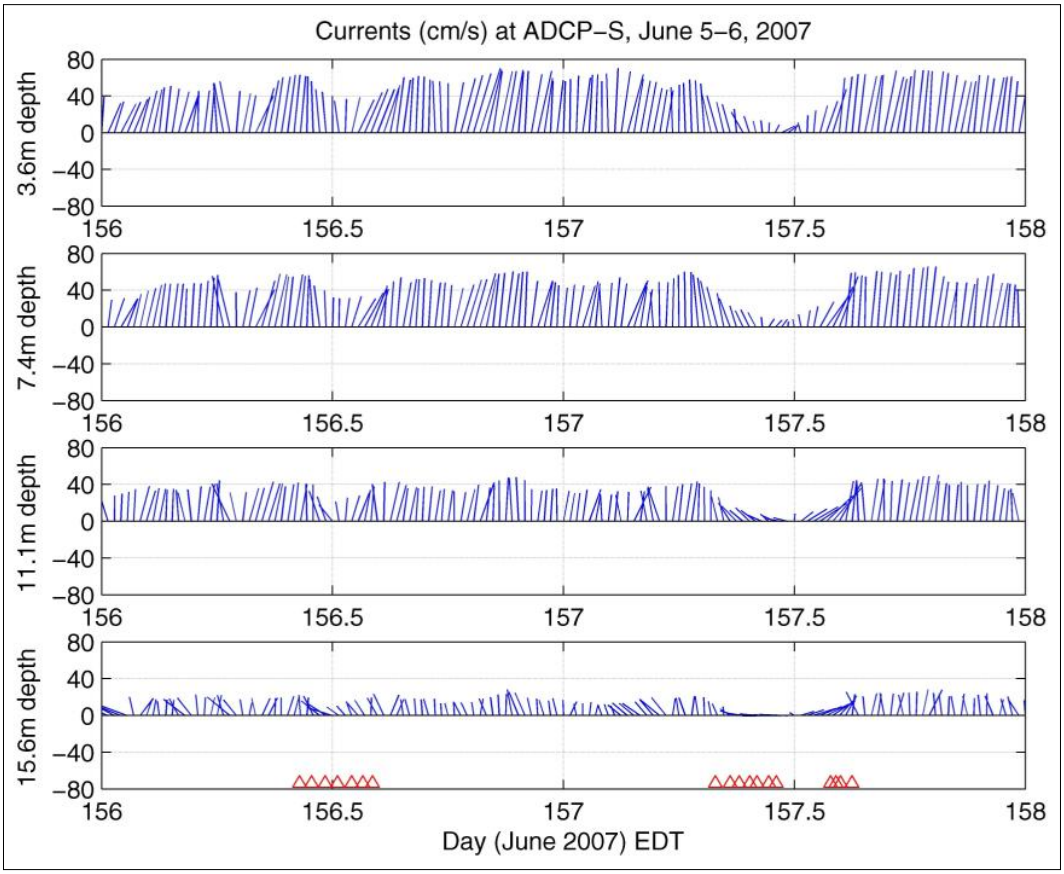

Figure 134a: Current direction and velocity during the June 2007 cruise. Depths were chosen to represent the surface, near the bottom, and two intermediary depths. Red triangles in the lowest panel denote times of each CTD cast. Length of each stick is proportional to the current speed as given by the y-axis.

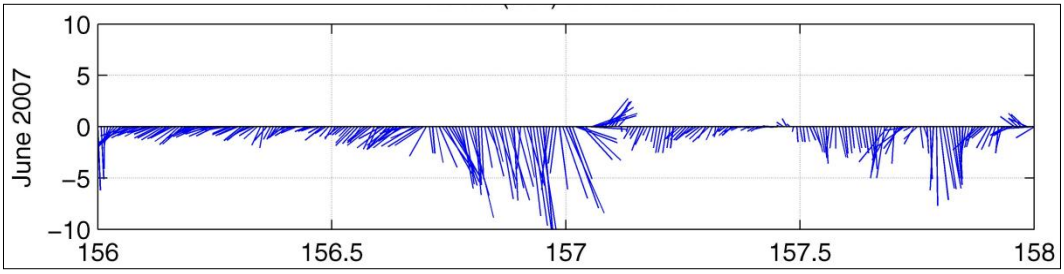

Figure 134b: Wind direction and velocity data from buoy LKWF1 during the time of the June 2007 cruise. Length of each stick is proportional to the wind speed (m/s) as given by the y-axis.

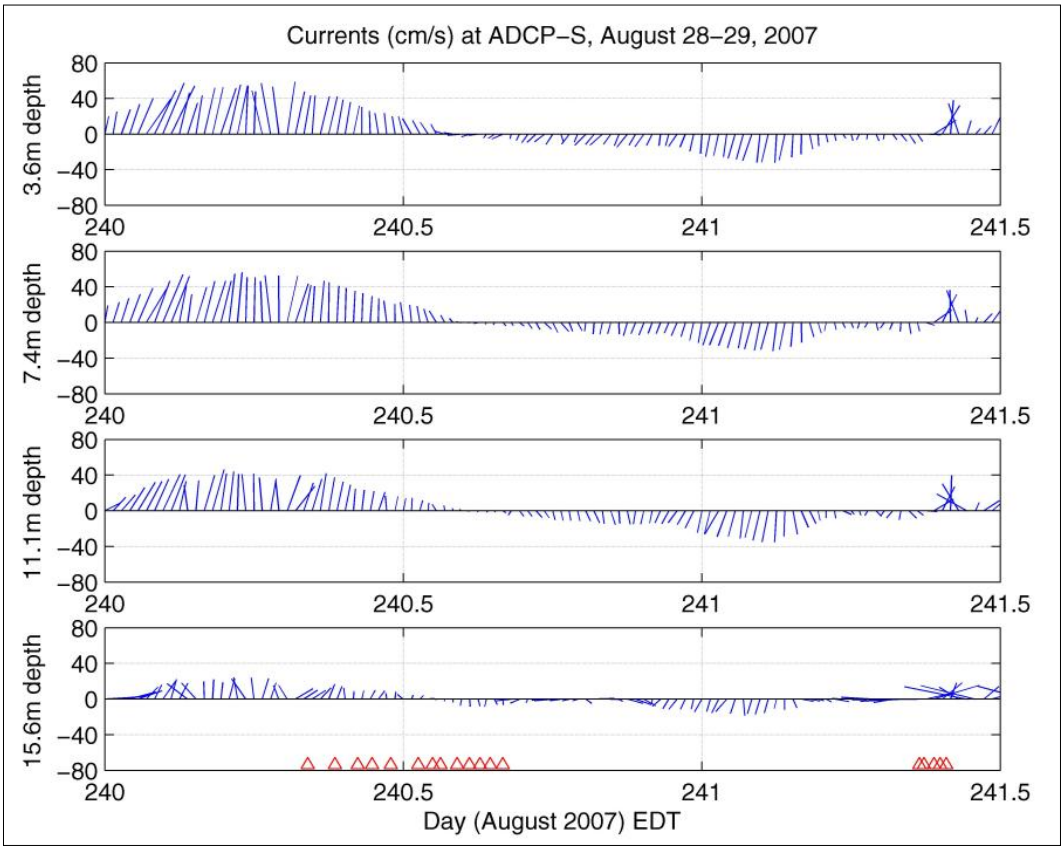

Figure 135a: Current direction and velocity during the August 2007 cruise. Format is similar to Figure 134a. Some samples around 240.65 (i.e., BD11) were evidently obtained in a southerly flow regime.

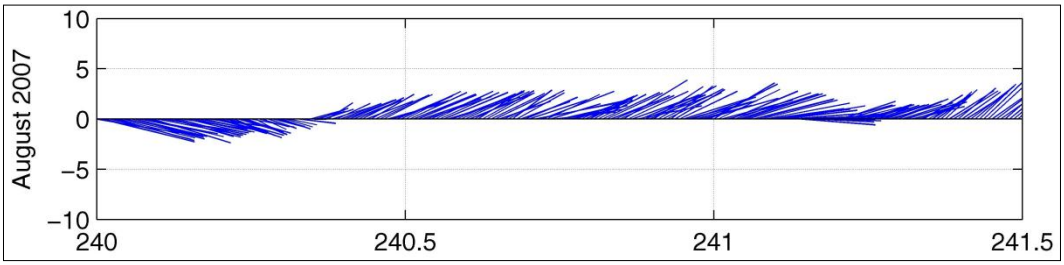

Figure 135b: Wind direction and velocity data from buoy LKWF1 during the time of the June 2007 cruise. Format is similar to Figure 134b.

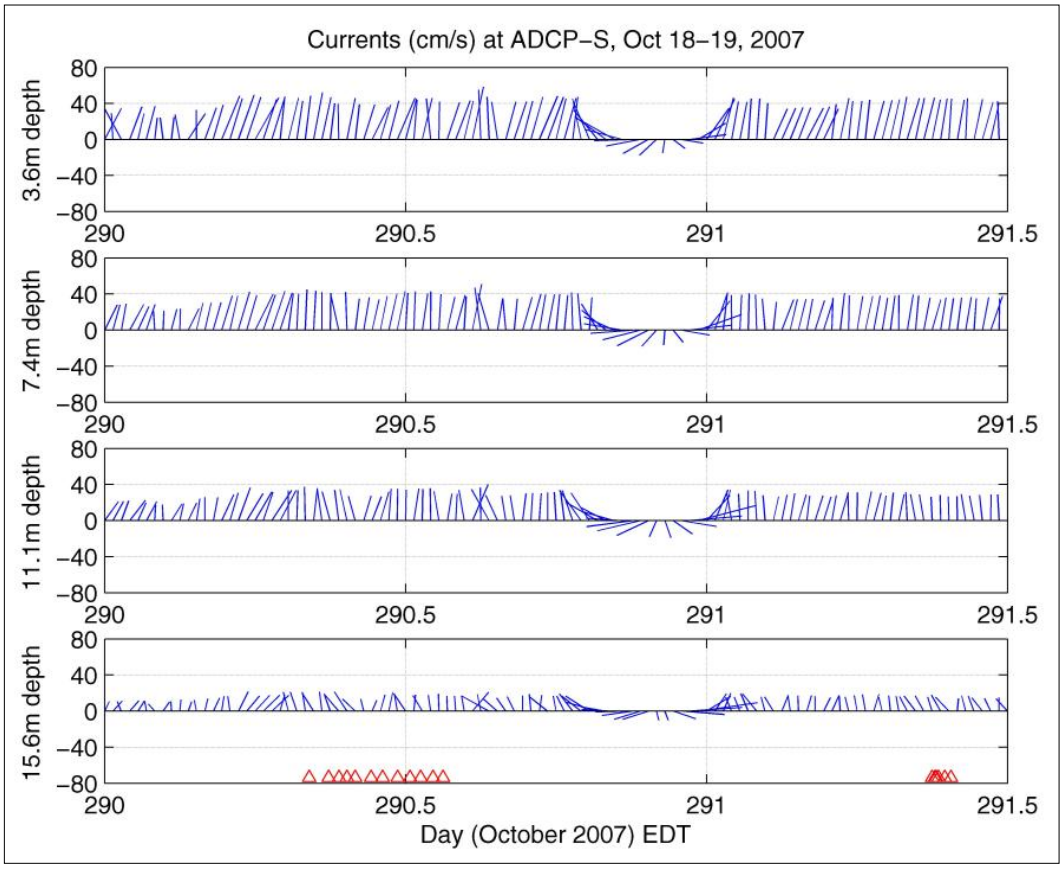

Figure 136a: Current direction and velocity during the October 2007 cruise. Format is similar to Figure 134a.

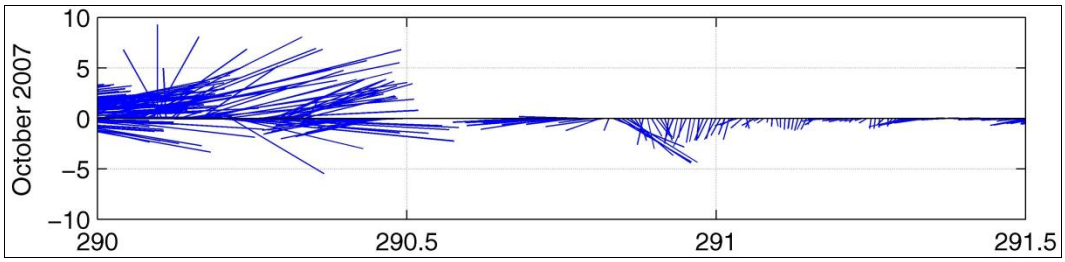

Figure 136b: Wind direction and velocity data from buoy LKWF1 during the time of the October 2007 cruise. Format is similar to Figure 134a.

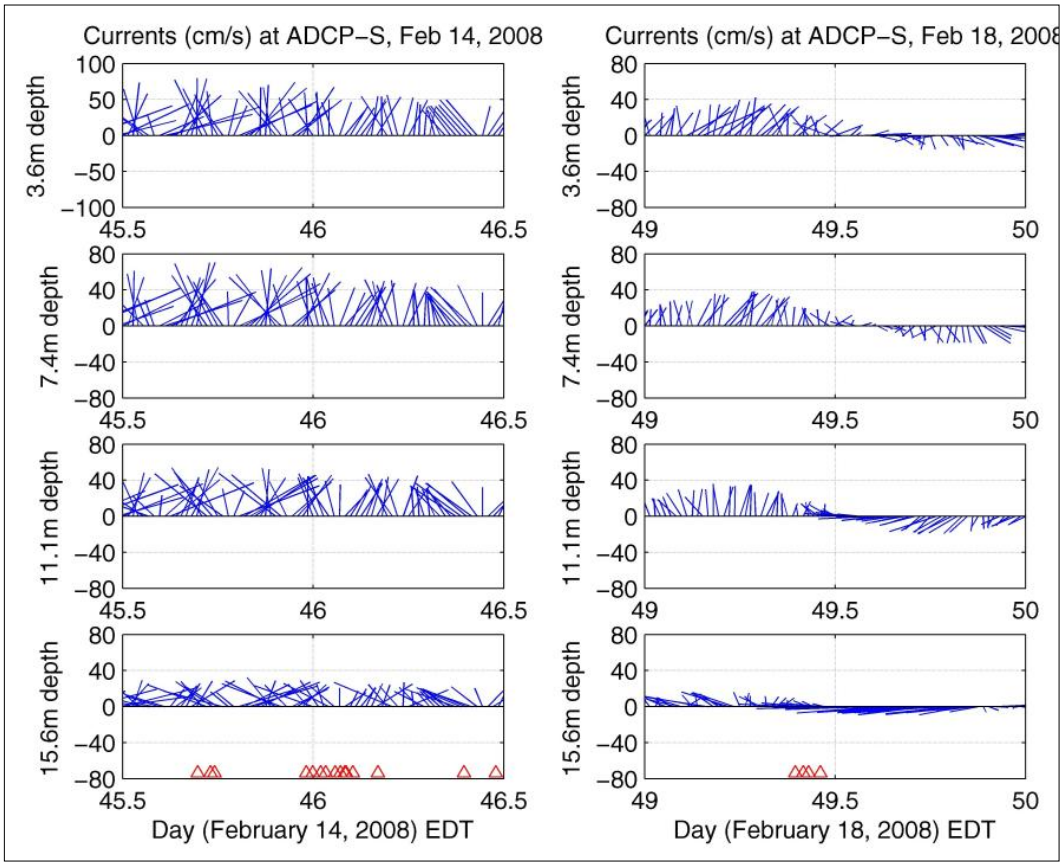

Figure 137a: Current direction and velocity during the February 2008 Boynton-Delray water quality monitoring cruise. Data from February 14 is presented in the left panel; February 18 on the right panel. Note that the 3.6-m depth for 14-February has a different vertical axis scale. Otherwise, format is similar to Figure 134a.

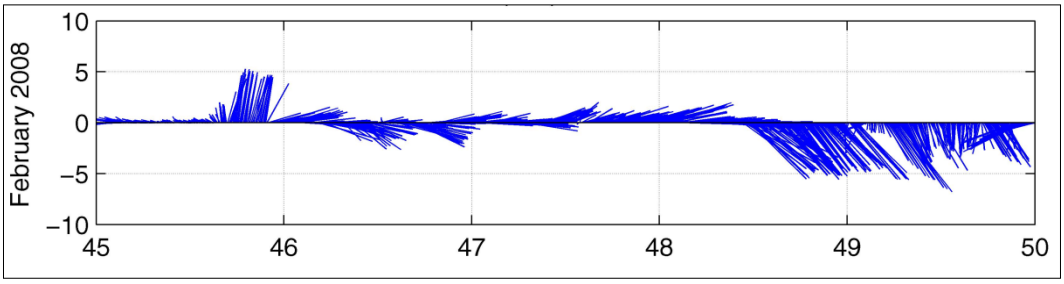

Figure 137b: Wind direction and velocity data from buoy LKWF1 during the time of the February 2008 cruise. Format is similar to Figure 134b.

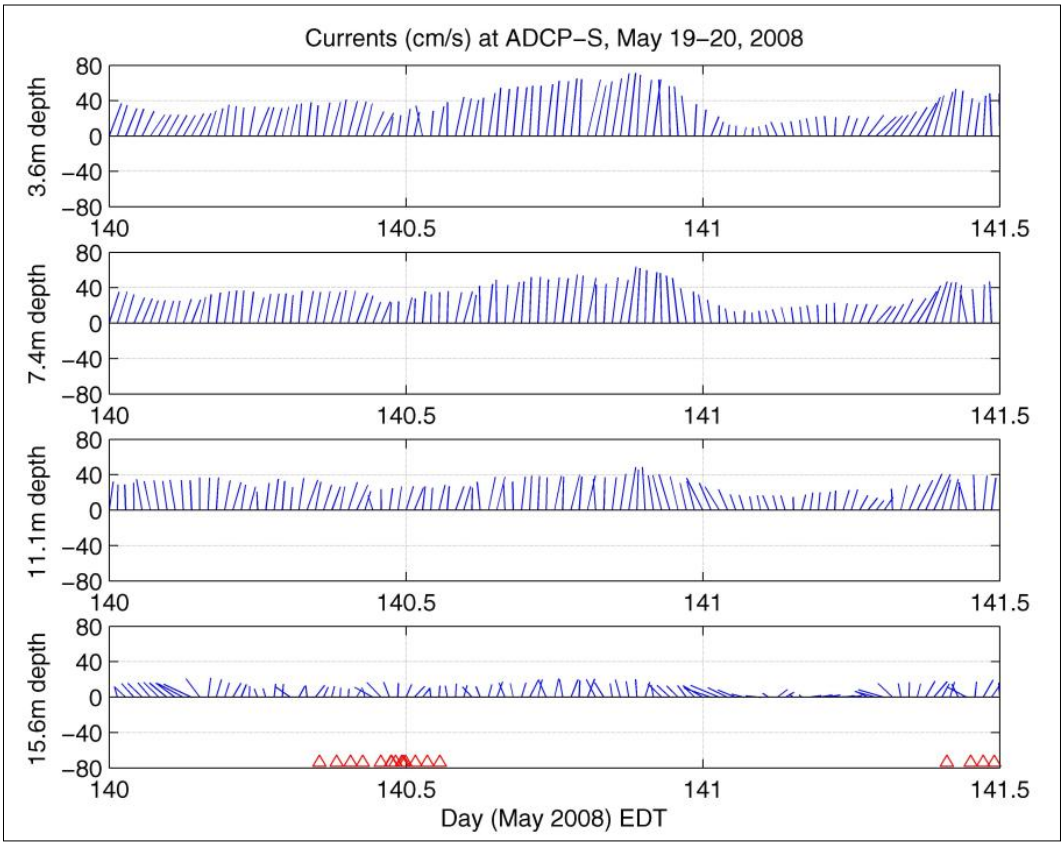

Figure 138a: Current direction and velocity during the May 2008. Format is similar to Figure 134a.

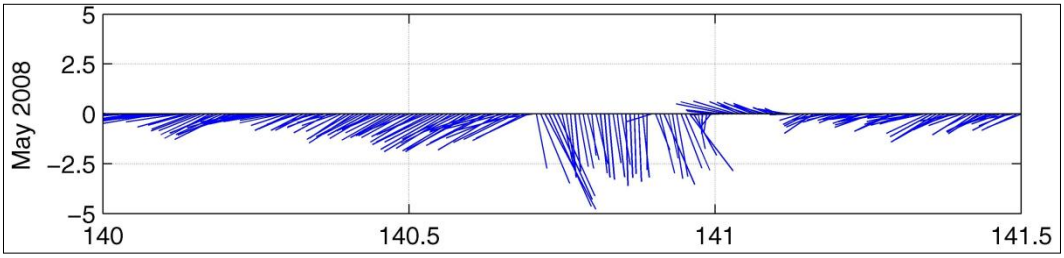

Figure 138b: Wind direction and velocity data from buoy LKWF1 during the time of the May 2008 cruise. Format is similar to Figure 134b.

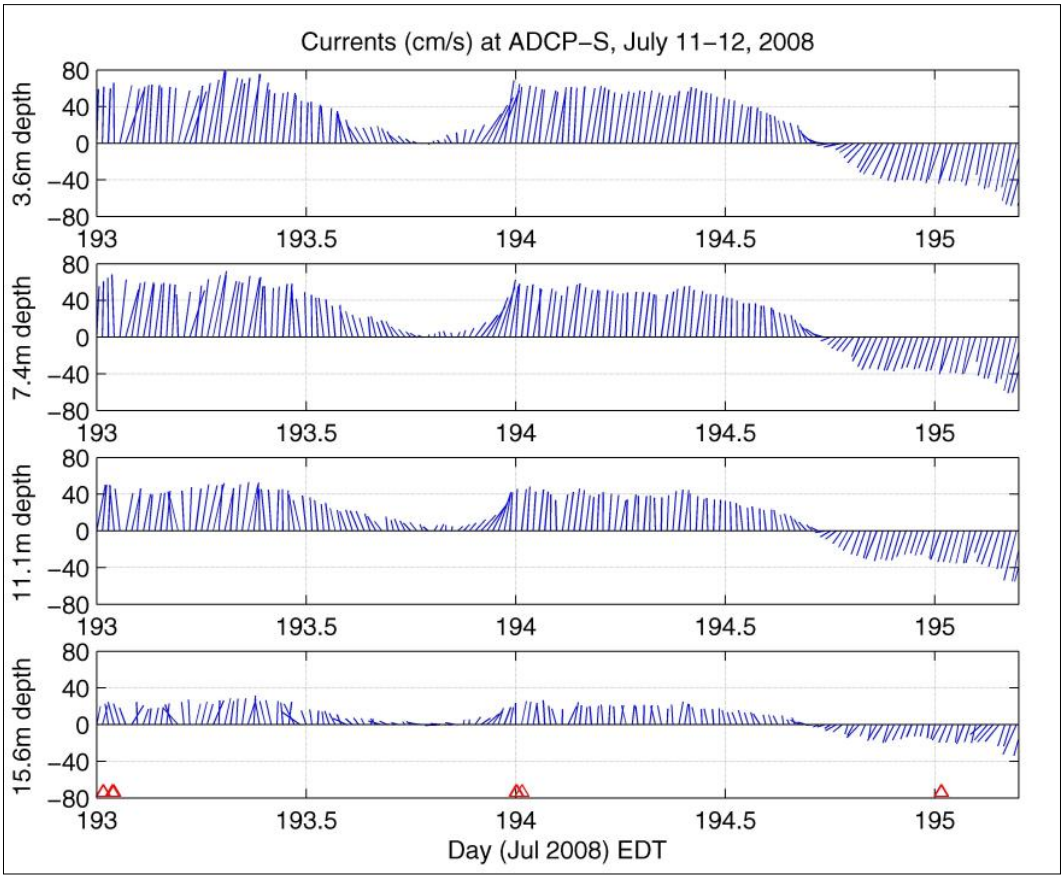

Figure 139a: Current direction and velocity during the July 2008 cruise. Format is similar to Figure 134a. Lagoon samples (BD16-18) were obtained during southerly current flow.

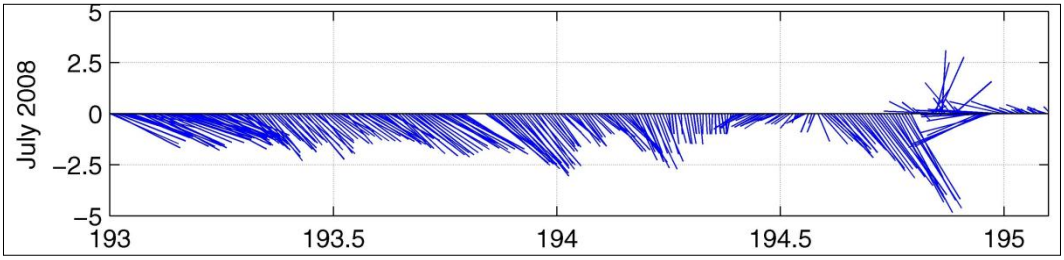

Figure 139b: Wind direction and velocity data from buoy LKWF1 during the time of the July 2008 cruise. Format is similar to Figure 134b.

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APPENDIX: A

PARTICULATE CHARACTERIZATION

13.0 PARTICULATE CHARACTERIZATION

Water samples were collected during the July 2008 sampling event to characterize the particulates at the outfall (BD-4A, B, C), the Boynton Inlet (BD-13A) and a reef site (BD-8A, B, C). Approximately 1-L of water was collected at each site and preserved in 2% gluteraldehyde buffered seawater. A 200 ml sample was filtered through a 47-mm diameter 0.4-µm Millepore® isopore membrane filter. Filters were then rinsed with 50 ml of distilled water to remove salts and air dried. A portion of each filter was placed on an aluminum stub with a carbon adhesive tab and coated with palladium. Each sample was analyzed by using a Scanning Electron Microscope (FEI XL-30 ESEM-FEG) at the University of Miami Center for Advanced Microscopy (UMCAM).

Enumeration of particles was computed using the following protocols:

A. >5µm size fraction particulate characterization:
    1. Surface area of 47 mm = 1320 mm^2 (excluding filter edge)
    2. Total area viewed per frame at 500x = 0.175 mm^2
    3. 14 frames viewed at 500x = 2.45 mm^2
    4. Particles per liter extrapolation was calculated by

        Number of Particles/Surface Area Examined X Total Surface Area of the Filter X 5(200 ml filtered) = Number Particles per Liter

B. $\leq$ 5µm size fraction particulate characterization:
    1. Surface area of 47 mm = 1320 mm^2 (excluding filter edge)
    2. Total area viewed per frame at 5000x = 0.0175 mm^2
    3. 10 frames viewed at 5000x = 0.0175 mm^2
    4. Particles per liter extrapolation was calculated by

        Number of Particles/Surface Area Examined X Total Surface Area of the Filter X 5(200 ml filtered) = Number Particles per Liter

Total Particle Concentration (TPC) = Sum of both size Fractions

13.1 >5µm Particulates

The > 5µm particulates ranged in concentration from 0.04 to 0.40 million particles per liter (MPL) (Table 1). The highest concentration of particulates > 5µm were found at the Boynton Inlet Site (BD-13A) (Figure 1). The Boynton Inlet site contained more than twice as many > 5µm particulates than any other locality examined in this study. Scanning electron microscopy (SEM) examination revealed that large chained centric diatoms (*Skelatonema sps*., *Chaetoceras sps*. and *Cyclotella sps*.) dominated the population with pinnate diatoms contributing a minor contribution (Figures 1-8). The surface sample collected at the South Central outfall boil (BD-4A) and near bottom reef

(BD-8C) sample exhibited the lowest particulate concentrations. The mid and near bottom outfall (BD-4B and BD-4C) and surface and mid depth reef samples (BD-8A and BD-8B) contained similar numbers of particulates per liter (Table 1 and Figure 1). Particulates most commonly found at all the sample sites, but in varying concentrations are shown in Figures 1-8.

Table 1: Particulate size concentration for each of the sample stations in million particles per liter (MPL) collected during July 2008 Boynton-Delray water quality monitoring.

Station	Particles > 5µm	Particles ≤ 5 µm	Total Particles/L
BD- 13 Inlet	**0.40**	**3.62**	**4.02**
BD-4A Surface Outfall	**0.04**	**1.55**	**1.58**
BD-4B Mid Depth Outfall	**0.13**	**3.84**	**3.97**
BD-4C Near Bottom Outfall	**0.11**	**2.11**	**2.22**
BD-8A Surface Reef	**0.19**	**5.54**	**5.73**
BD-8B Mid Depth Reef	**0.11**	**3.77**	**3.88**
BD-8C Near Bottom Reef	**0.06**	**1.13**	**1.19**

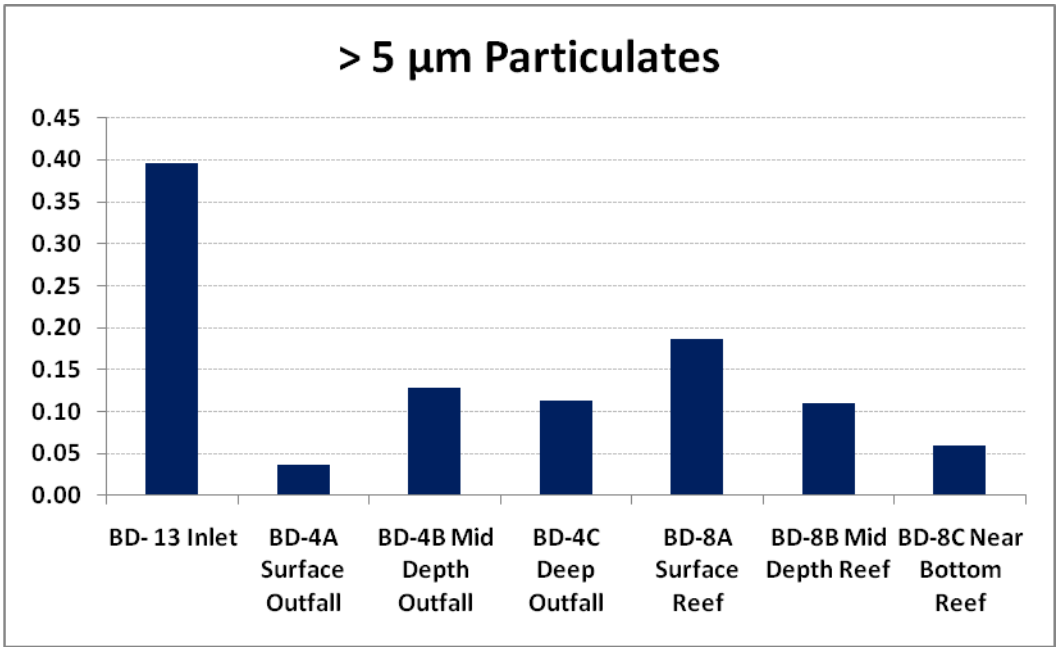

Figure 1: Particulate concentration (MPL) of the >5µm size fraction in water samples collected during July 2008 Boynton-Delray water quality sampling.

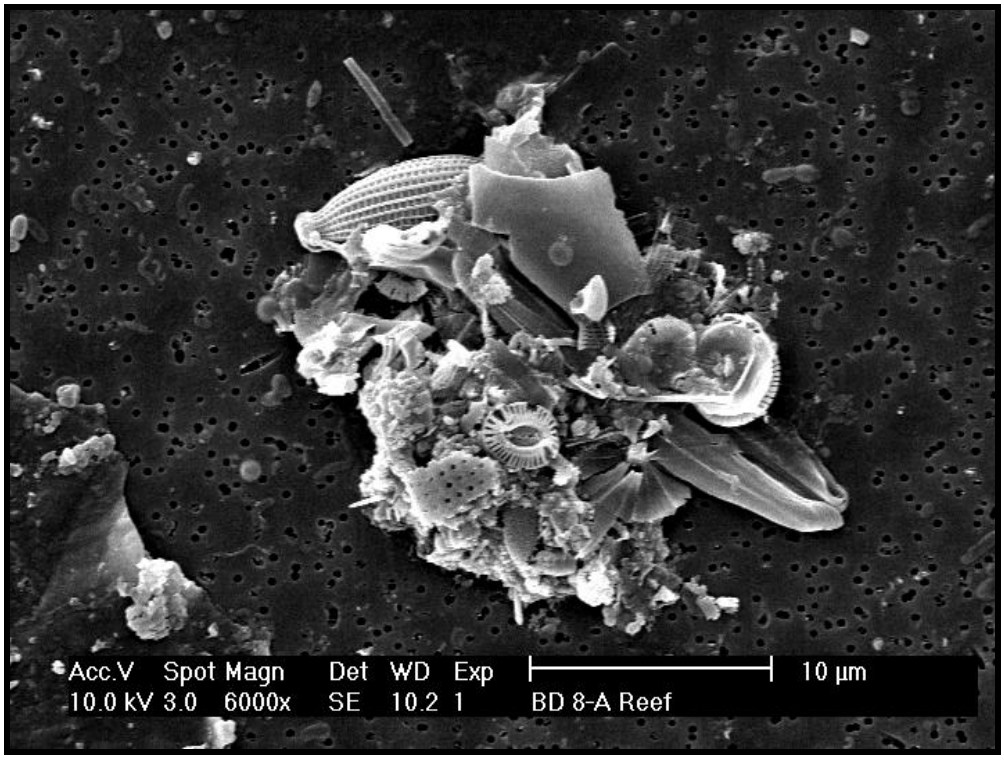

Figure 2: Fecal pellet containing diatoms and coccoliths in the >5µm size fraction at station BD-8A (surface waters over the reef).

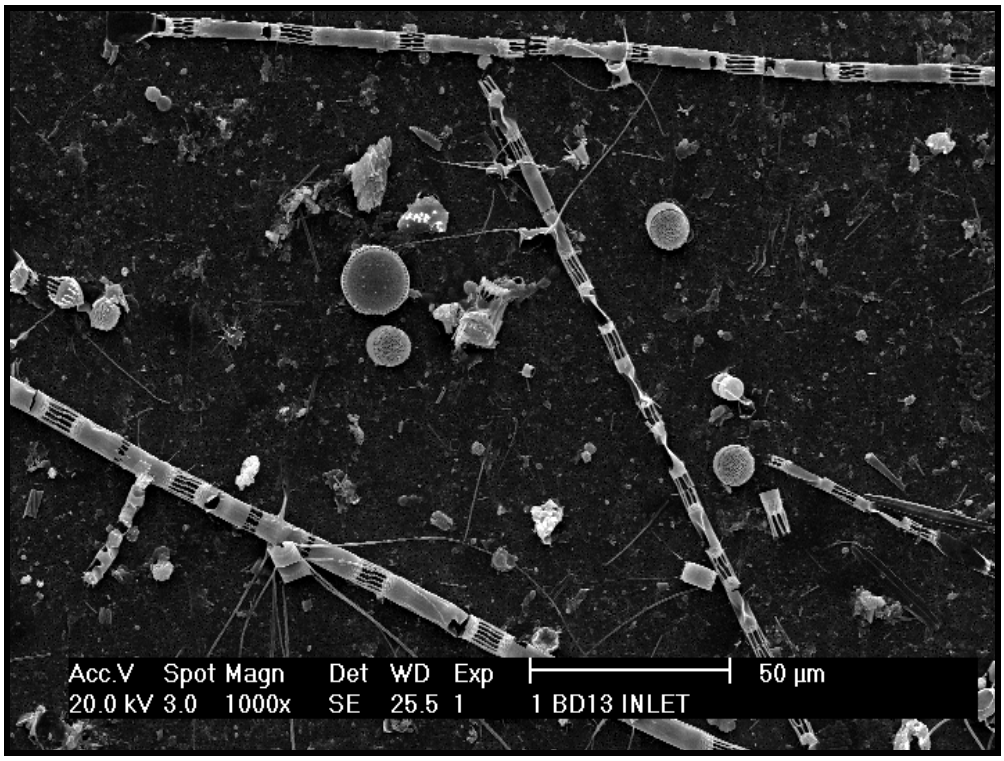

Figure 3: Diatom distribution (predominately *Skelatonema sps*. and *Cyclotella sps*.) in the >5µm size fraction in Boynton Inlet sample BD-13A .

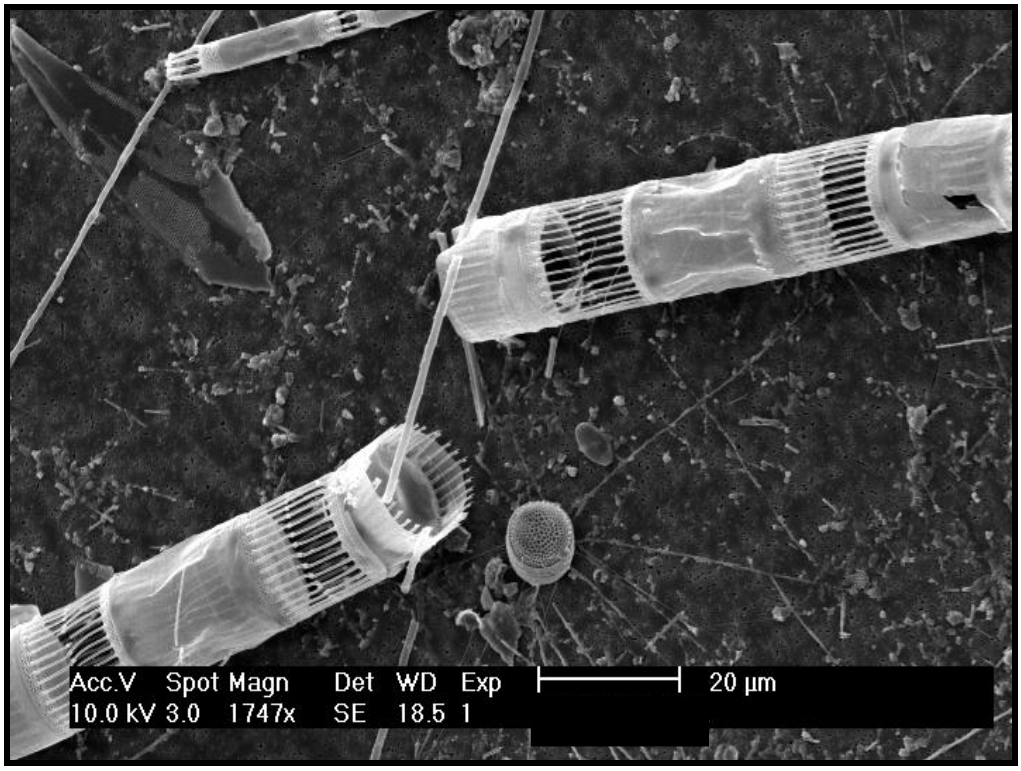

Figure 4: Detail of *Skelatonema sps*. in the greater than5µm size fraction from Boynton Inlet BD-13A.

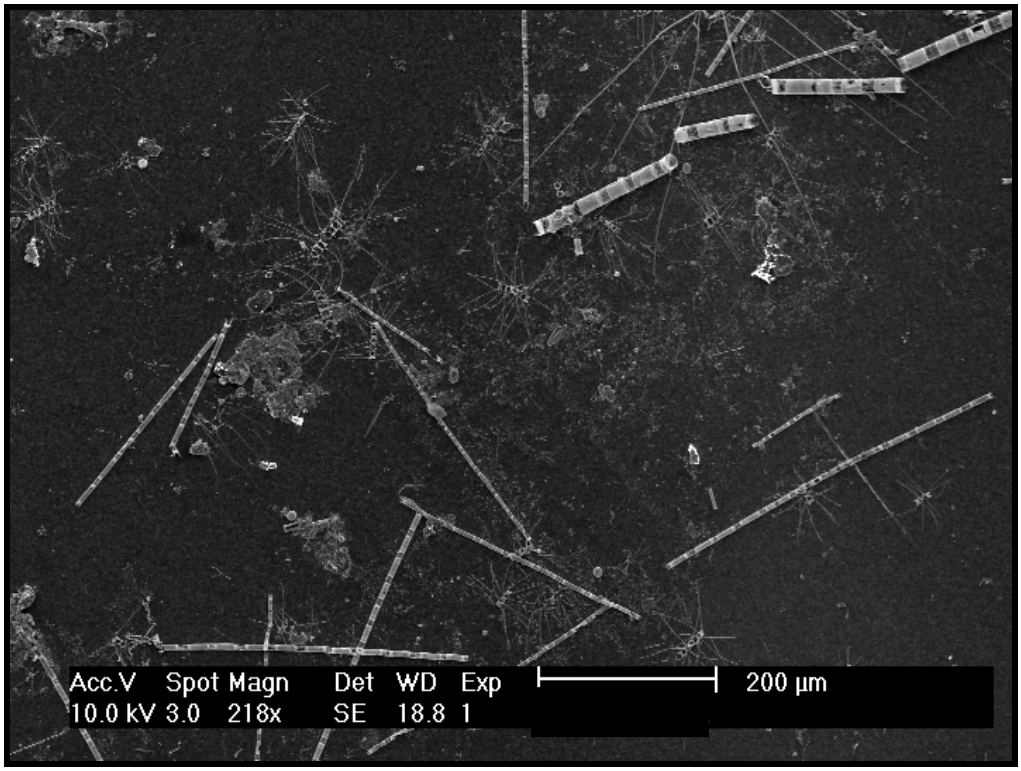

Figure 5: Centric diatom distribution in the >5µm size fraction from Boynton Inlet BD-13A.

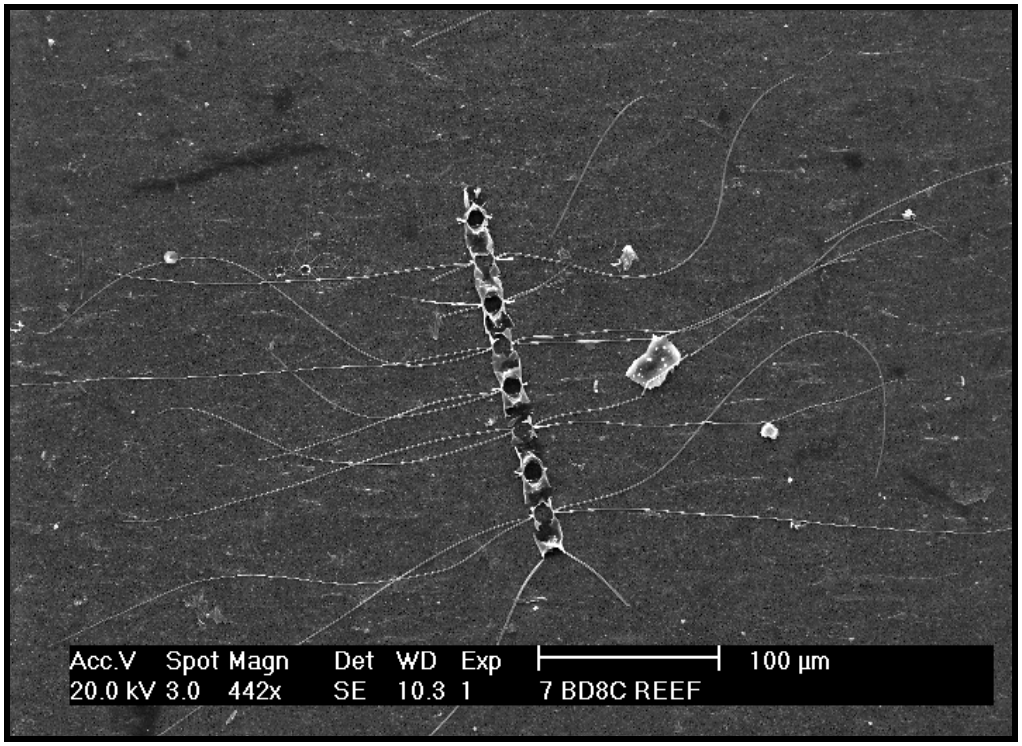

Figure 6: *Chaetoceros sps*. observed in the >5µm centric diatom population from sample BD-8C (near bottom reef).

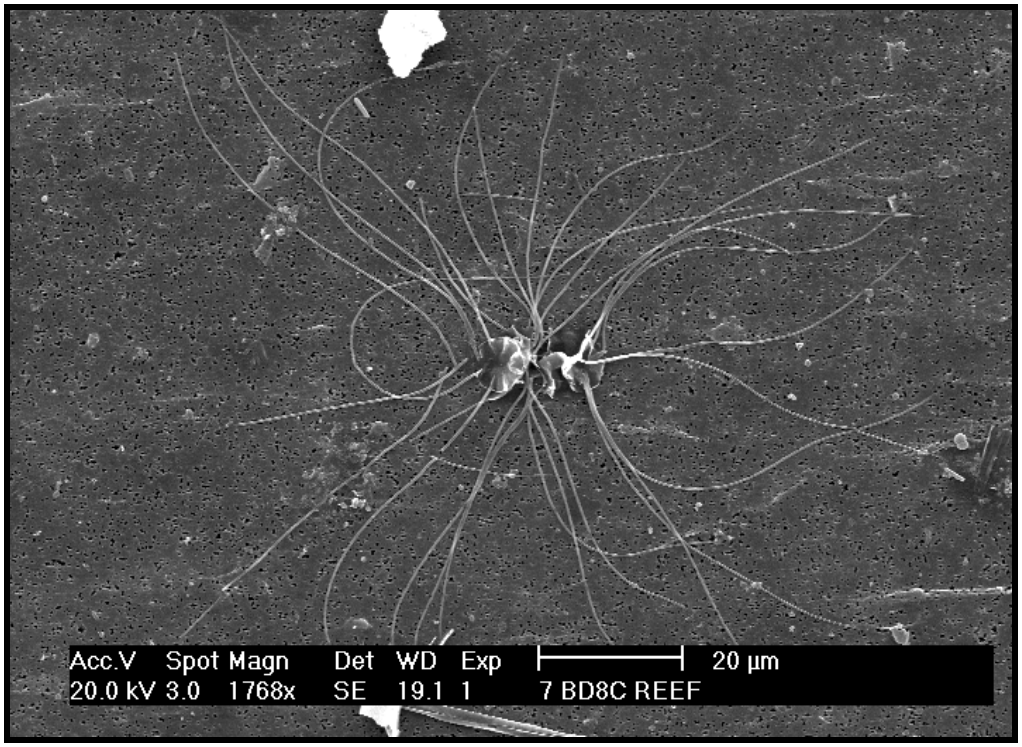

Figure 7: >5µm centric diatom in sample BD-8C (near bottom reef).

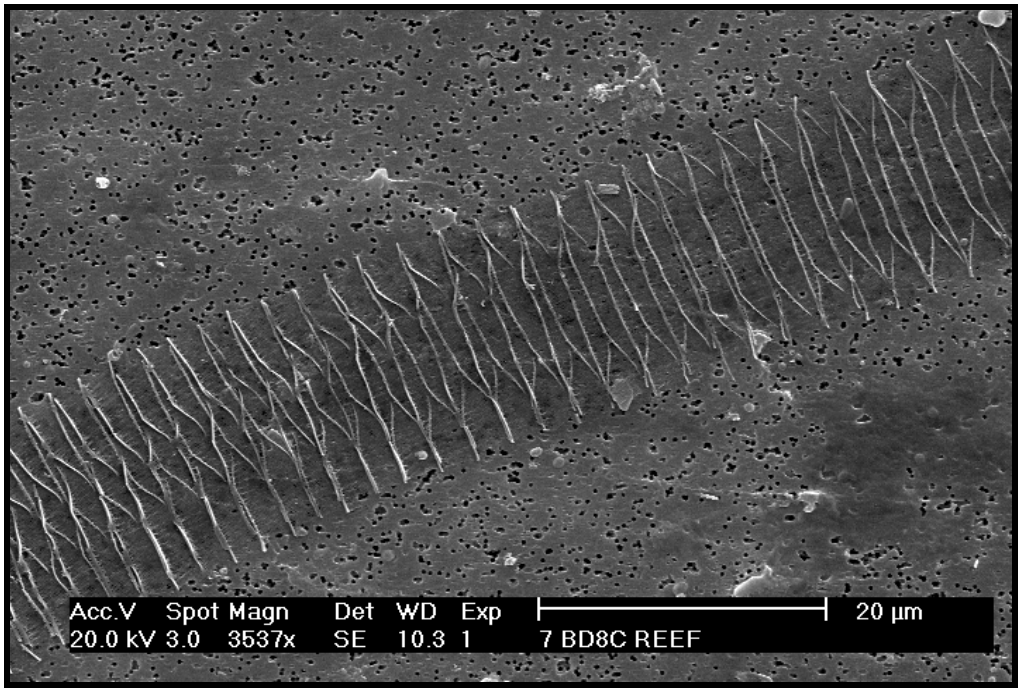

Figure 8: Chain of pennate diatoms in sample BD-8C (near bottom reef).

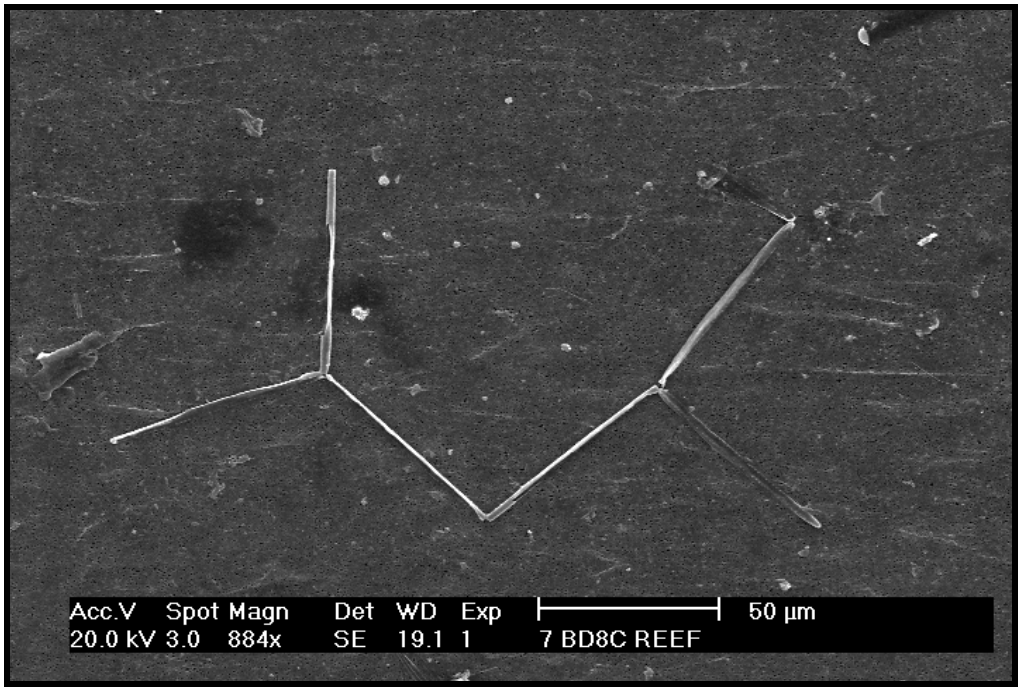

Figure 9: >5um pennate diatoms in sample BD-8C (near bottom reef).

13.2 ≤ 5µm Particulates

The samples ≤ 5µm particulates ranged in concentration from 1.13 to 5.54 MPL (Table 1), with the highest concentration at the surface reef site (BD-8A, Figure 10). Boynton Inlet, mid-depth outfall (BD-4B) and mid-depth reef (BD-8B) sites had similar concentrations of ≤5µm particulates ranging from 3.62 to 3.84 MPL. The surface and near bottom outfall (BD-4A and B), and near bottom reef (BD-8C) sites had the lowest concentrations of ≤ 5µm particulates ranging from 1.13 to 2.11 MPL. The majority of the ≤ 5µm particulates were comprised of small algae and elongate/coccoid shaped bacteria (Figures 11-20).

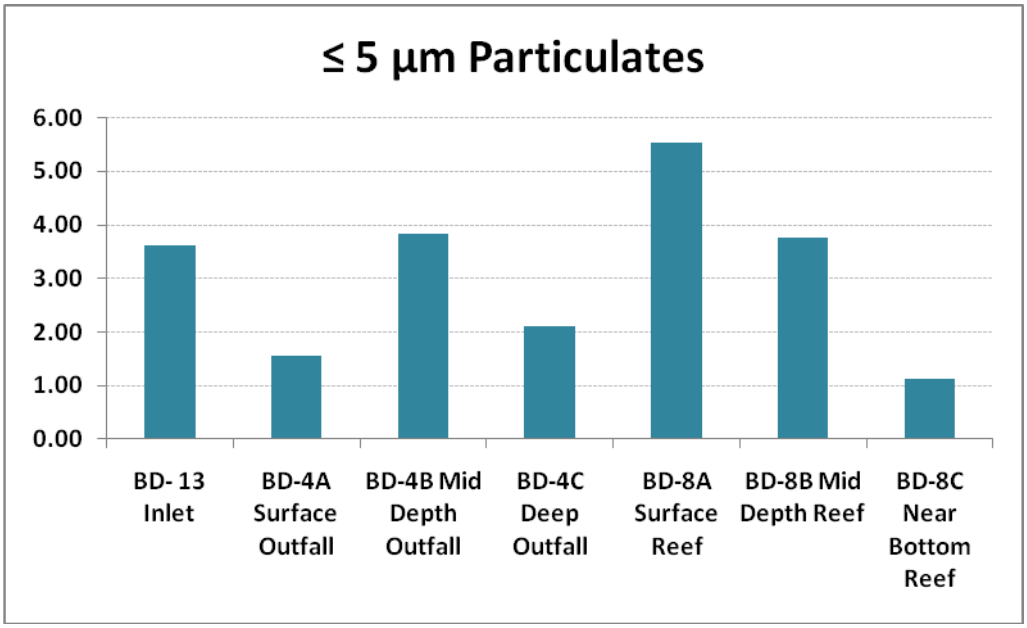

Figure 10: Total particle concentration (MPL) in the ≤ 5µm size fraction for water samples collected during July 2008 Boynton-Delray water quality sampling.

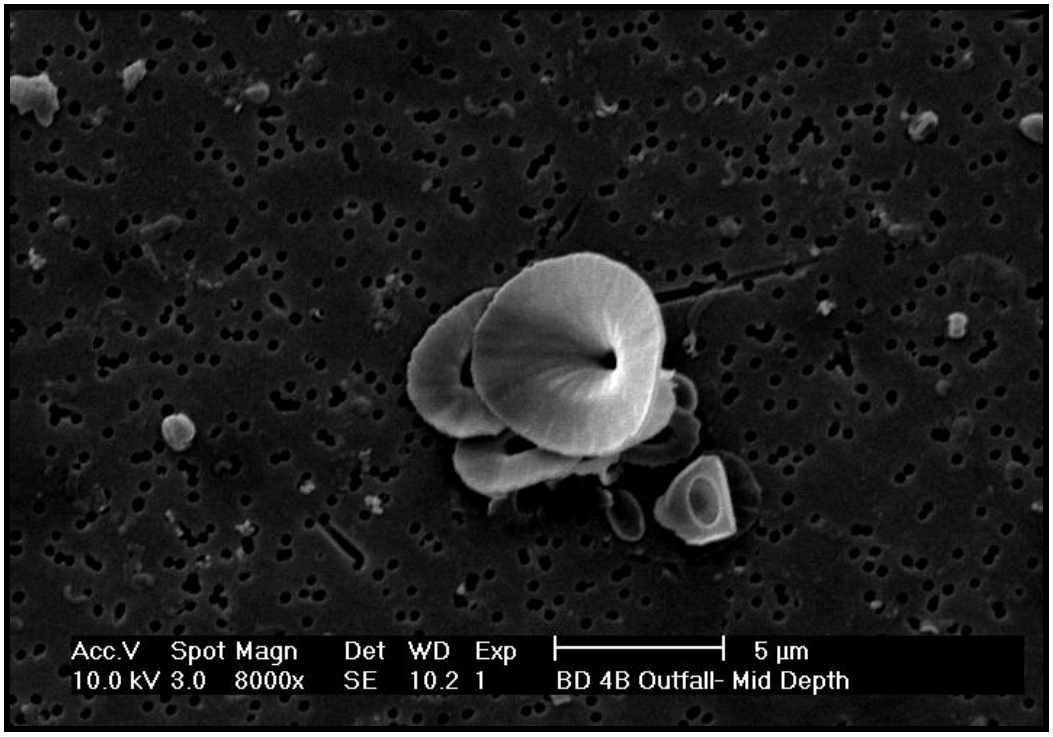

Figure 11: Coccoliths (disarticulated calcium carbonate plates of coccolithophorid algae) collected in the ≤5µm size fraction at site BD-4B (mid-depth South Central Outfall).

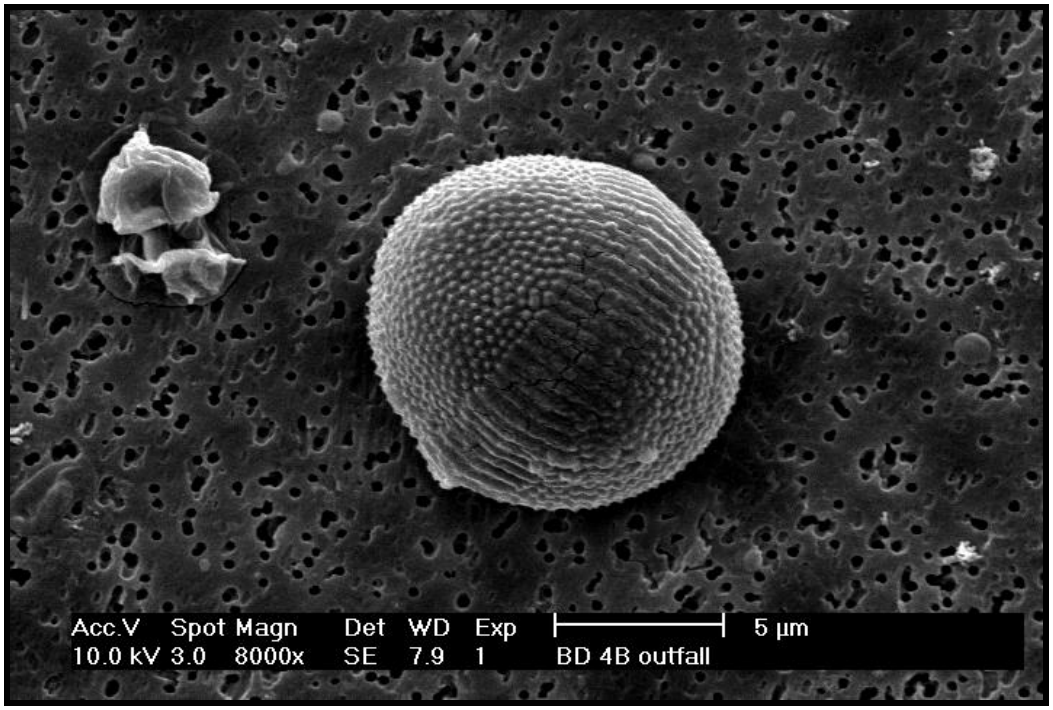

Figure 12: Dinoflagellate in the ≤5µm size fraction at site BD-4B (mid-depth South Central Outfall).

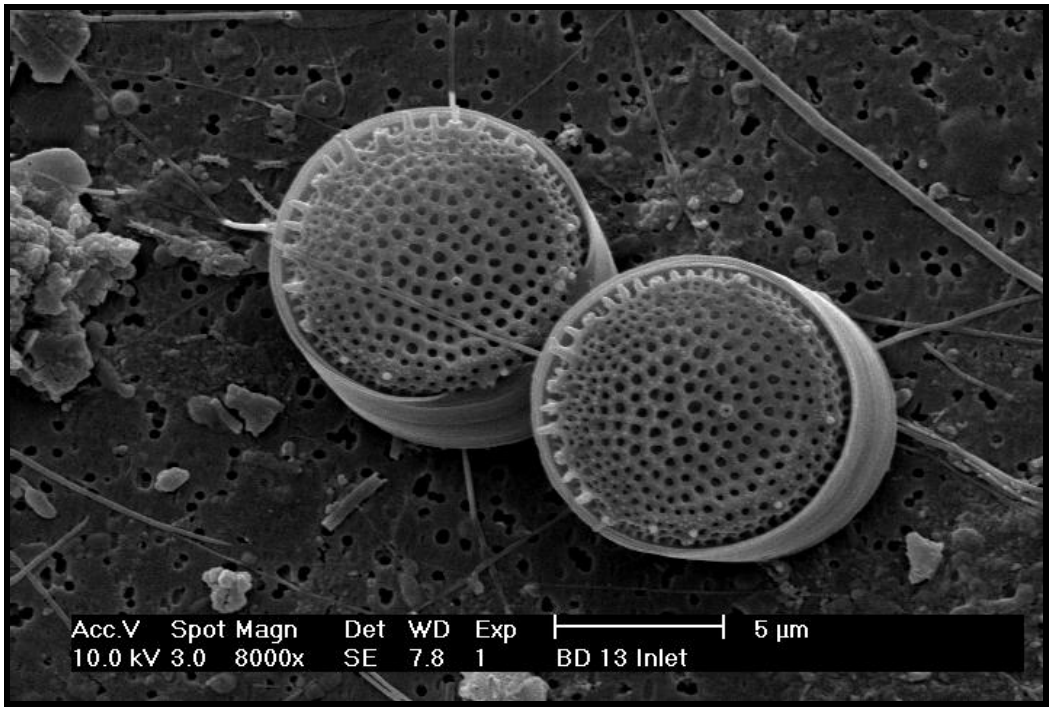

Figure 13: Small centric siliceous diatoms at site BD-4B (mid-depth South Central Outfall).

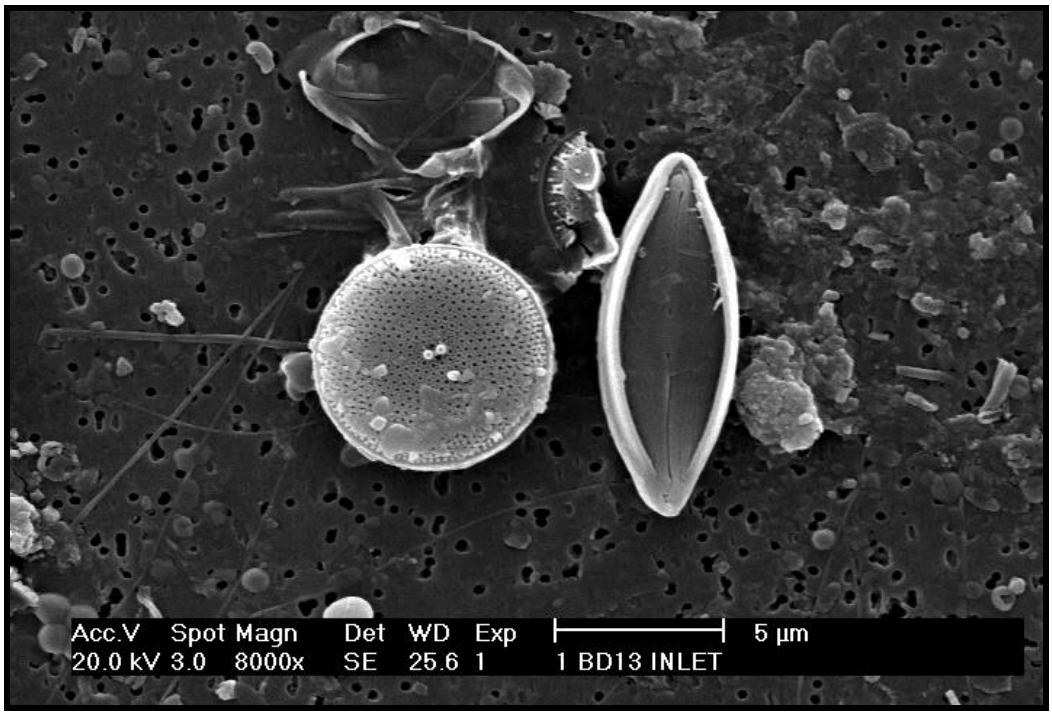

Figure 14: Small siliceous centric and pennate diatoms in the near ≤5µm size fraction from BD-13A (Boynton Inlet).

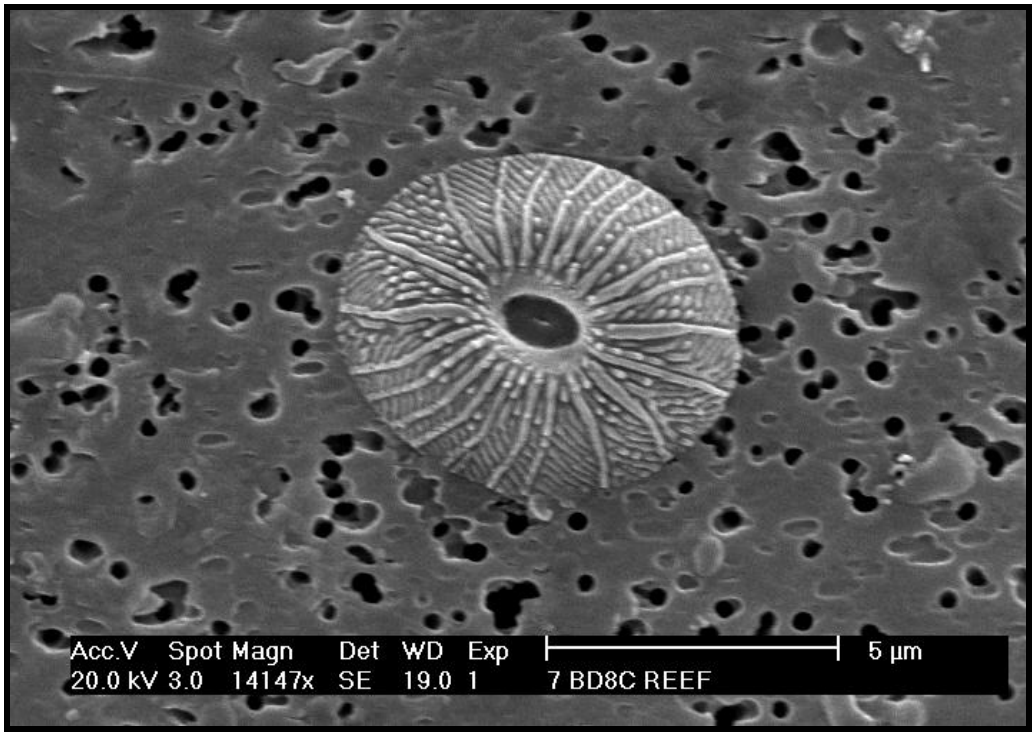

Figure 15: A calcium carbonate cocccolith (*Umbellosphaera tenuis*) in the ≤5µm size fraction at site BD-8C (near bottom Reef).

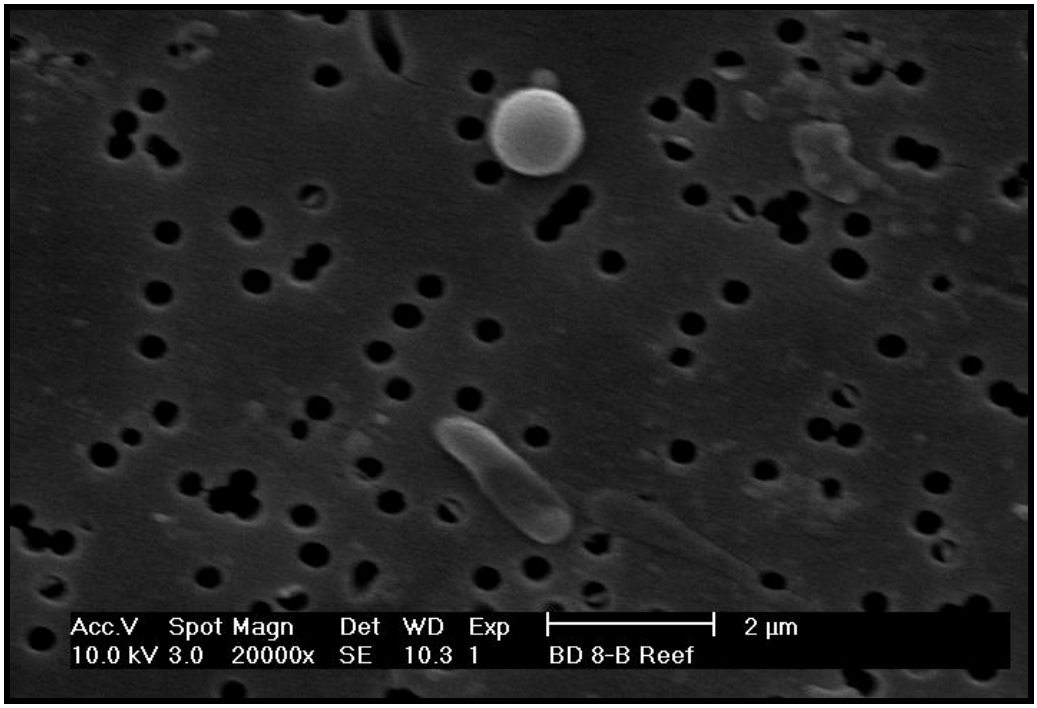

Figure 16: Elongate and coccoid shaped bacteria from sample BD-8B (mid-depth Reef).

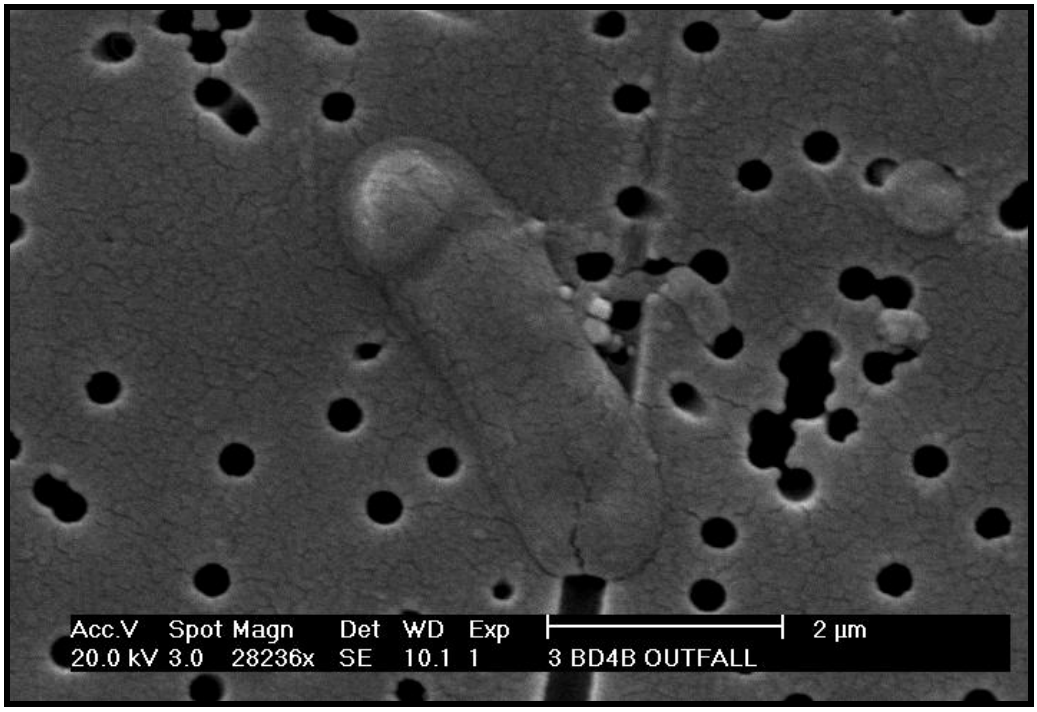

Figure 17: Bacteria from sample BD-4B (mid-depth South Central Outfall).

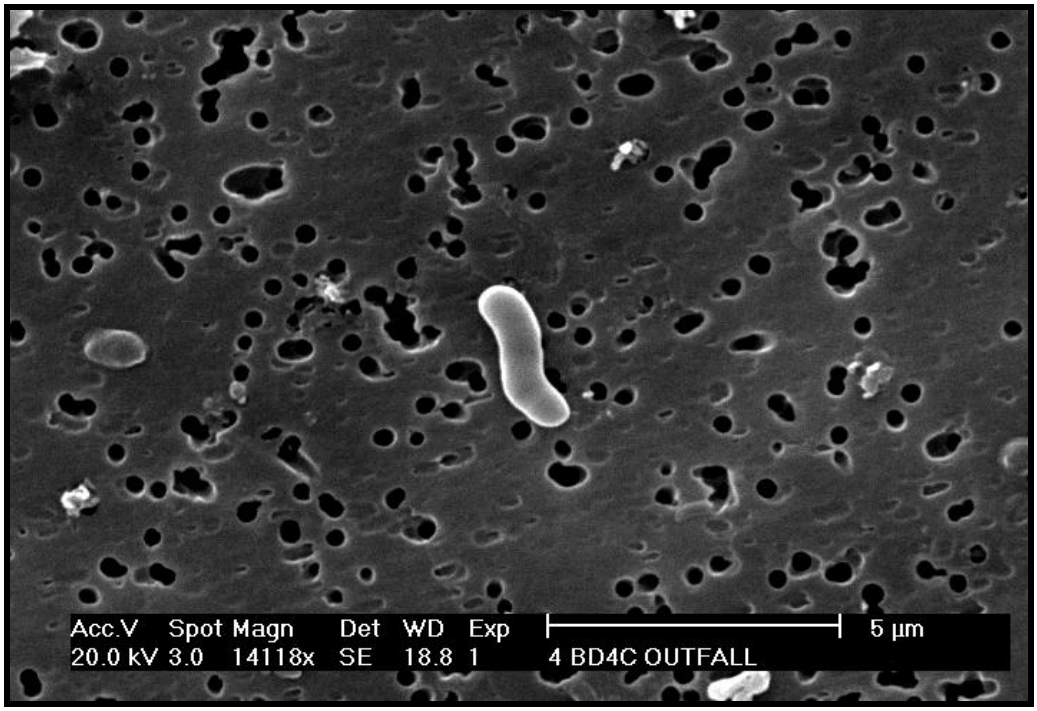

Figure 18: Bacteria from sample BD-4C (near bottom South Central Outfall).

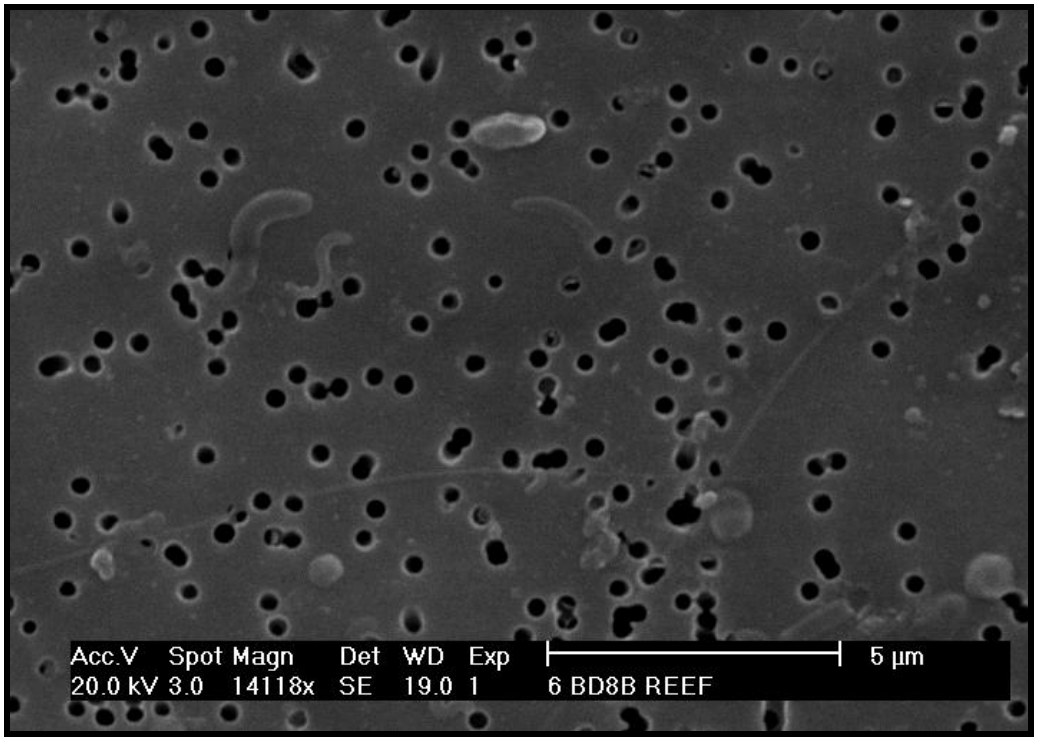

Figure 19: Coccoid bacteria from sample BD-8B (mid-depth Reef).

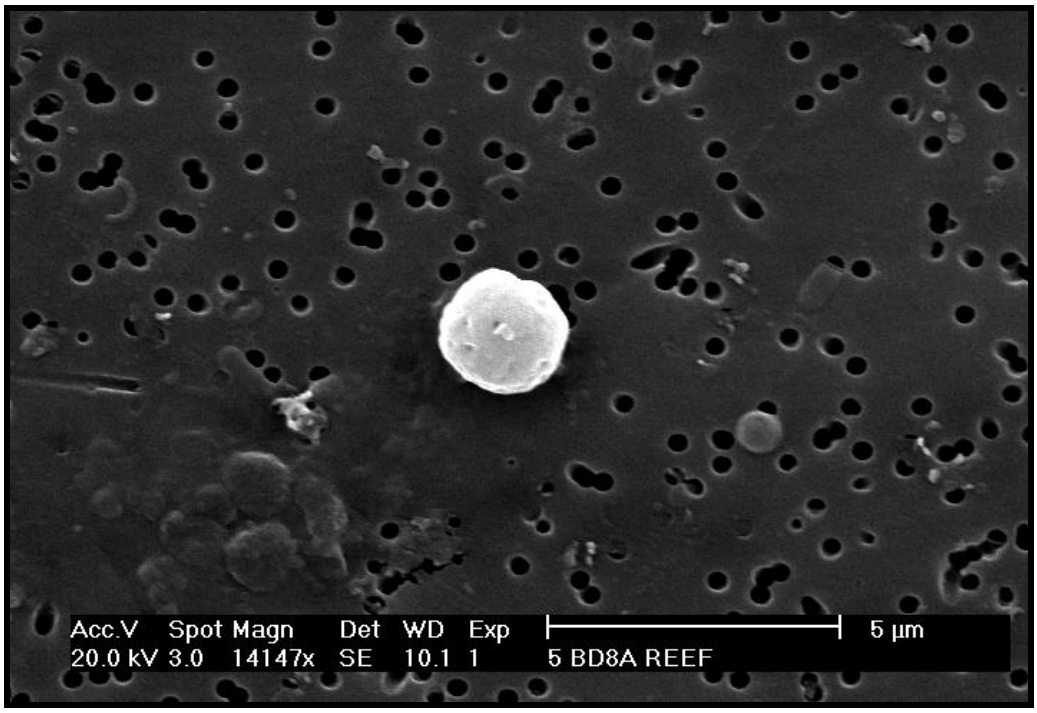

Figure 20: Coccoid shaped bacteria (background) from sample BD-8A (surface Reef).

13.3 Total Particulates

Total particulate concentrations estimated in the SEM ranged from 1.19 to 5.73 MPL (Figure 21). The high concentration at the surface reef site (BD-8A, 5.73 MPL) (Figure 21, Figure 10) was due to the ≤ 5µm size fraction contribution.. The Boynton Inlet (BD-13), mid-depth outfall (BD-4B) and mid-depth reef (BD-8B) sites had similar concentrations ranging from 3.88 to 4.02 MPL. The surface outfall (BD-4A), deep outfall (BD-4C) and near bottom reef (BD-8C) sites had similar concentrations ranging from 1.19 to 2.22 MPL.

The higher concentration of the larger particulates in BD-13 (0.40MPL) compared to the other localities which range from 0.04 to 0.19 (Figure 21), would result in a much greater biomass concentration from this sample. This is consistent with the chlorophyll-a, and silica (Si) results reported in this technical report. There was a greater concentration of small particles in BD-8A (Figure 10) comprised of very small bacteria. Although qualitatively important, they contribute relatively little to biomass. Future studies will include an estimation of mass, would provide additional information and enable conversion from concentration (MPL) to relative mass (gms /liter).

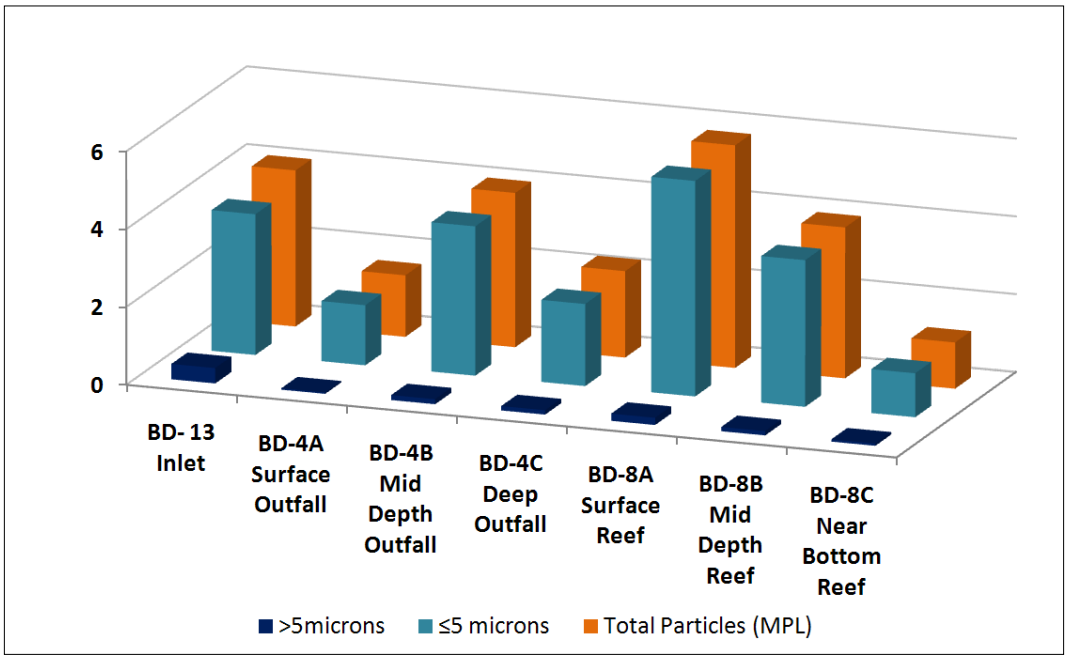

Figure 21: Comparison of the total number of particles (MPL) in the > 5µm size fraction and ≤ 5µm size fraction in water samples collected during the July 2008 Boynton-Delray water quality sampling. Although concentration of greater than five micron particulates in BD-13 (inlet) was twice as high as in the other samples collected, the concentration of very small particulates was highest in BD-8A (reef surface).

APPENDIX: B

QUALITY CONTROL-ASSURANCE ASSESSMENT

14.0 QUALITY CONTROL-ASSURANCE ASSESSMENT

Quality assurance-control (QA/QC) procedures for the Boynton-Delray water quality monitoring surveys involved collecting field duplicates from the same five stations (BD-4A, BD-7B, BD-10C, BD-15C and BD-18A) during the duration of the project. Duplicates were collected for the following water quality parameters: N+N, NH4, P, Silicate-Si, total dissolved nitrogen, total dissolved phosphorus, dissolved organic carbon, total suspended solids, chlorophyll and pH. Duplicate samples were collected in separate sample containers for individual analysis. Blanks (laboratory, equipment and trip) were also collected and analyzed for the following water quality parameters: N+N, NH4, P, Silicate-Si, total suspended solids and chlorophyll.

Nutrient samples were filtered aboard the boat immediately after collection and placed on ice. Dissolved organic carbon, total dissolved nitrogen and phosphorus, and total suspended solids were placed on ice and filtered back at AOML. Chlorophyll samples were filtered aboard the boat following collection if sea conditions allowed, if not samples were placed on ice and filtered at the end of the survey day which provided a more immediate sample preservation than waiting until returning to AOML.

14.1 PRECISION

The precision of the QA/QC data was estimated by calculating the relative percent difference (RPD) of field duplicate samples. The field duplicate results provided an estimate of the total variability due to both sampling and analytical procedures. Tables 1-6 shows the relative percent difference for nutrients, DOC, chlorophyll, TSS and pH. Table 7 shows the overall number of samples that fell within each relative percent difference range. The target RPD ranges were based on the Boynton-Delray water quality monitoring plan and were 0-10% for nutrient, DOC and pH, and 0-20% for chlorophyll and TSS samples. Approximately 65% of the nutrient sample duplicates fell within the 0-10% RPD range. Forty two percent of TSS duplicates, 60% of DOC duplicates, 93% of chlorophyll duplicates and 100% of pH duplicates fell within their appropriate RPD ranges. Chlorophyll and pH had the best field precision, while the nutrients, DOC and TSS had much lower precision. A number of contributing factors could have lead to lower RPDs such as instrument malfunction while analyzing duplicate samples, static while weighing filters, duplicate filter having a larger particle on it such as a piece of algae and possible contamination while sampling. Overall the field precision was good for all six of the water quality monitoring sampling events.

14.2 ACCURACY

Field accuracy was assessed through use of trip and equipment blanks. The blanks were also used to determine if samples collected have been contaminated. Trip and equipment blanks consisted of reagent grade de-ionized water and/or low nutrient seawater (LNSW) collected from the Gulfstream. Table 8 and 9 shows the results for the equipment and trip blanks collected during each of the six water quality monitoring sampling events. No

trip or equipment blanks were collected during the February 2008 and July 2008 sampling events. The minimum detection limit (MDL) for each parameter sampled is listed in Table 5 of this report. All equipment and trip blanks were found to be below the MDL for each parameter sampled for each of sampling events in which blanks were collected except for the following; (1) the trip and equipment blank had a high NH4 reading of 1.42 µM suggesting that the LNSW used during May 2008 was high in this constituent and was not caused by contamination from sampling, (2) the trip and equipment blank had an above MDL reading in Nitrate-N + Nitrite-N (0.36 µM) suggesting that the LNSW used during August 2008 was high in this constituent and was not caused by contamination from sampling, (3) the trip blank for TSS during October 2007 had a value above the MDL which may be the result of an erroneous weight measurement due to interference of static in the filter with the microbalance during the initial weighing process, and (4) the equipment blank for chlorophyll during June 2007 had a slightly higher value above the MDL which may indicate contamination.

14.3 BELOW DETECTION LIMITS

Table 10 lists the percent of data for each parameter for each of the six water quality monitoring sampling events that fell below detection levels. Orthophosphate-P and Sihad the largest percentage of data below detection limits.

14.4 COMPLETENESS

Tables 11 and 12 show the percentage of completeness for each parameter sampled during each of the six water quality monitoring sampling events. Filed completeness during sample collection was good for all sampling events except for the following; (1) during October 2007 (89%) due to foul weather and marine conditions in which stations BD-14 and BD-15 were not sampled and (2) during February 2008 (82%) due to depth related issues with the R/V Nancy Foster and poor marine conditions for smaller boat operations in which stations BD-9, BD-12 and BD-14 were not sampled. Laboratory completeness was good for each parameter sampled during all six sampling events except for TDN and TDP during June 2007, and TDP during October 2007 and February 2008. TDN and TDP samples were held passed there holding times due to equipment malfunctions due to the possible questionable results the samples were not analyzed.

Table 1: Relative percent difference (RPD) for water quality parameters during the June 2007 Boynton-Delray water quality monitoring survey.

Station	N+N	NH4	P	Silicate-Si	TDN	TDP	DOC	TSS	Chlorophyll	pH
BD-4A	71.4	0.0	0.0	0.0	N/A	N/A	N/A	6.9	3.9	0.1
BD-7B	2.9	0.0	0.0	0.0	N/A	N/A	N/A	24.1	2.3	0.0
BD-10C	0.0	4.6	157.9	0.0	N/A	N/A	N/A	76.5	2.9	0.1
BD-15C	0.0	1.8	1.8	0.0	N/A	N/A	N/A	16.5	1.8	0.0
BD-18A	2.5	27.7	100.0	0.0	N/A	N/A	N/A	5.3	0.2	0.1

Table 2: Relative percent difference (RPD) for water quality parameters during the August 2007 Boynton-Delray water quality monitoring survey.

Station	N+N	NH4	P	Silicate-Si	TDN	TDP	DOC	TSS	Chlorophyll	pH
BD-4A	2.5	0.4	2.2	0.2	23.8	4.0	3.2	14.6	2.7	0.1
BD-7B	66.7	100.0	100.0	0.0	9.4	8.4	2.6	34.8	89.3	0.0
BD-10C	0.0	100.0	0.0	24.3	22.2	4.4	4.1	91.3	2.6	0.0
BD-15C	0.0	0.0	0.0	0.0	9.5	17.6	1.1	17.2	2.1	0.0
BD-18A	7.9	5.7	26.1	1.0	0.3	8.1	0.4	27.7	0.3	0.0

Table 3: Relative percent difference (RPD) for water quality parameters during the October 2007 Boynton-Delray water quality monitoring survey.

Station	N+N	NH4	P	Silicate-Si	TDN	TDP	DOC	TSS	Chlorophyll	pH
BD-4A	10.5	0.0	100.0	0.0	17.5	N/A	15.5	31.6	1.0	0.1
BD-7B	15.4	100.0	0.0	0.0	7.7	N/A	3.2	44.4	1.1	0.1
BD-10C	14.3	0.0	0.0	0.0	3.9	N/A	1.3	4.0	0.6	0.1
BD-15C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BD-18A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.1	N/A

Table 4: Relative percent difference (RPD) for water quality parameters during the February 2008 Boynton-Delray water quality monitoring survey.

Station	N+N	NH4	P	Silicate-Si	TDN	TDP	DOC	TSS	Chlorophyll	pH
BD-4A	35.6	N/A	0.0	0.0	7.6	N/A	14.3	38.6	3.1	0.1
BD-7B	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BD-10C	50.0	N/A	0.0	0.0	20.9	N/A	1.3	6.7	8.2	0.1
BD-15C	N/A	N/A	N/A	N/A	18.3	N/A	8.1	3.4	7.9	0.1
BD-18A	2.2	N/A	3.6	0.0	12.3	N/A	11.0	3.0	4.6	1.1

Table 5: Relative percent difference (RPD) for water quality parameters during the May 2008 Boynton-Delray water quality monitoring survey.

Station	N+N	NH4	P	Silicate-Si	TDN	TDP	DOC	TSS	Chlorophyll	pH
BD-4A	100.0	39.8	31.1	0.0	6.8	23.1	10.6	10.1	0.2	0.1
BD-7B	0.0	5.9	0.0	0.0	94.1	12.9	1.0	4.7	0.2	0.1
BD-10C	0.0	50.0	0.0	0.0	23.3	3.6	40.5	N/A	2.5	0.0
BD-15C	0.0	8.2	0.0	0.0	3.0	134.4	145.5	2.1	1.4	0.1
BD-18A	33.3	4.8	12.5	22.2	13.7	2.0	25.7	9.1	2.9	0.2

Table 6: Relative percent difference (RPD) for water quality parameters during the July 2008 Boynton-Delray water quality monitoring survey.

Station	N+N	NH	P	SI	TDN	TDP	DOC	Chlorophyll	TSS	pH
BD-4A	5.4	111.0	0.0	25.8	15.1	81.8	22.5	23.5	3.6	0.2
BD-7B	0.0	13.3	0.0	0.0	5.1	100.0	7.0	14.4	0.7	0.1
BD-10C	13.3	11.8	0.0	0.0	0.2	14.3	3.3	N/A	0.5	0.1
BD-15C	0.0	40.0	0.0	6.2	13.4	34.8	12.3	N/A	16.9	0.1
BD-18A	3.1	4.6	3.5	3.1	3.0	0.0	5.7	4.3	2.4	0.3

Table 7: Overall relative percent difference (RPD) of duplicate samples collected during the Boynton-Delray water quality monitoring surveys for each of the water quality parameters.

RPD (%)	N+N	NH	P	SI	TDN	TDP	DOC	Chlorophyll	TSS	pH
0-10	16	13	19	23	11	7	13	26	10	27
10-20	4	2	1	0	6	3	5	1	5	0
20-30	0	1	0	3	4	2	2	0	3	0
30-40	2	2	2	0	0	0	0	0	3	0
40-50	1	1	0	0	0	0	1	0	1	0
50-60	0	0	0	0	0	0	0	0	0	0
60-70	1	0	0	0	0	0	0	0	0	0
70-80	1	0	0	0	0	0	0	0	1	0
80-90	0	0	0	0	0	1	0	1	0	0
90-100	1	3	3	0	1	1	0	0	1	0
> 100	0	1	1	0	0	1	1	0	0	0
Total # Samples	26	23	26	26	22	15	22	28	24	27

Table 8: Equipment blank results for all six Boynton-Delray water quality monitoring cruises. Units are uM for nutrients, mg/L for TSS and ug/L for Chlorophyll

Date	N+N	NH4	P	Silicate-Si	Total Suspended Solids	Chlorophyll
June-07	0	0.011	0	0	0.01	0.089
August-07	0.36	0	0	0	0.08	0.006
October-07	0.06	0	0.015	0	0.03	0.002
February-08	N/A	N/A	N/A	N/A	N/A	N/A
May-08	0.08	1.42	0	0	0.1	0.001
July-08	N/A	N/A	N/A	N/A	N/A	N/A

Table 9: Trip blank results for all six Boynton-Delray water quality monitoring cruises. Units are uM for nutrients, mg/L for TSS and ug/L for Chlorophyll

Date	N+N	NH4	P	Silicate-Si	Total Suspended Solids	Chlorophyll
June-07	0.001	0.011	0	0	0.03	0.002
August-07	0.36	0	0	0	N/A	0.003
October-07	0	0	0	0	0.43	0.002
February-08	N/A	N/A	N/A	N/A	N/A	N/A
May-08	0.01	1.42	0	0	0.09	0.003
July-08	N/A	N/A	N/A	N/A	N/A	N/A

Table 10: Number and percent of data which fell below detection limits of each parameter sampled during each of the six sampling events.

Number BDL	N+N	NH	P	SI	TDN	TDP	DOC	Chlorophyll	TSS	pH
June 2007	0	0	36	30	N/A	N/A	N/A	0	0	0
August 2007	9	20	28	19	0	0	0	0	0	0
October 2007	0	22	24	35	0	N/A	0	0	0	0
February 2008	0	N/A	21	33	0	N/A	0	0	0	0
May 2008	33	0	35	41	0	0	0	0	0	0
July 2008	17	0	43	9	0	6	0	0	0	0
Total Number	272	227	272	272	227	136	227	272	272	272
% BDL	21.7%	18.5%	68.7%	61.4%	0.0%	6.6%	0.0%	0.0%	0.0%	0.0%

Table 11: Percent of field completeness for sample collection during each of the six sampling events.

Date	N+N	NH	P	SI	TDN	TDP	DOC	Chlorophyll	TSS	pH
June 2007	100%	100%	100%	100%	100%	100%	100%	98%	100%	100%
August 2007	98%	98%	98%	98%	100%	100%	100%	100%	100%	100%
October 2007	89%	89%	89%	89%	89%	89%	89%	89%	89%	89%
February 2008	82%	0%	82%	82%	82%	82%	82%	82%	82%	82%
May 2008	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
July 2008	100%	100%	100%	100%	100%	100%	100%	98%	100%	100%

Table 12: Percent of lab completeness for sample analysis during each of the six sampling events.

Date	N+N	NH	P	SI	TDN	TDP	DOC	Chlorophyll	TSS	pH
June 2007	100%	100%	100%	100%	0%	0%	0%	98%	100%	100%
August 2007	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
October 2007	100%	100%	100%	100%	100%	0%	100%	100%	100%	100%
February 2008	100%	N/A	100%	100%	100%	0%	100%	100%	100%	100%
May 2008	100%	100%	100%	100%	96%	100%	100%	96%	100%	100%
July 2008	100%	100%	100%	100%	98%	94%	98%	98%	100%	98%